NASDAQ: BTAI

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Developing Transformative Medicines Utilizing AI Approaches

December 2021

Forward-Looking Statements

This presentation includes "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements in this presentation include but are not limited to the advancement and development of BXCL501, BXCL502, and BXCL701, anticipated milestones, clinical development plans, the availability and results of data from clinical trials, expected patent terms and issuances, potential commercialization and related strategy and other information that is not historical information. When used herein, words including "anticipate," "being," "will," "plan," "may," "continue," and similar expressions are intended to identify forward-looking statements. In addition, any statements or information that refer to expectations, beliefs, plans, projections, objectives, performance, or other characterizations of future events or circumstances, including any underlying assumptions, are forward-looking. All forward-looking statements are based upon BioXcel Therapeutics' current expectations and various assumptions. BioXcel believes there is a reasonable basis for its expectations and beliefs, but they are inherently uncertain.

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Our Mission

Develop transformative medicines utilizing AI approaches in neuroscience and immuno-oncology

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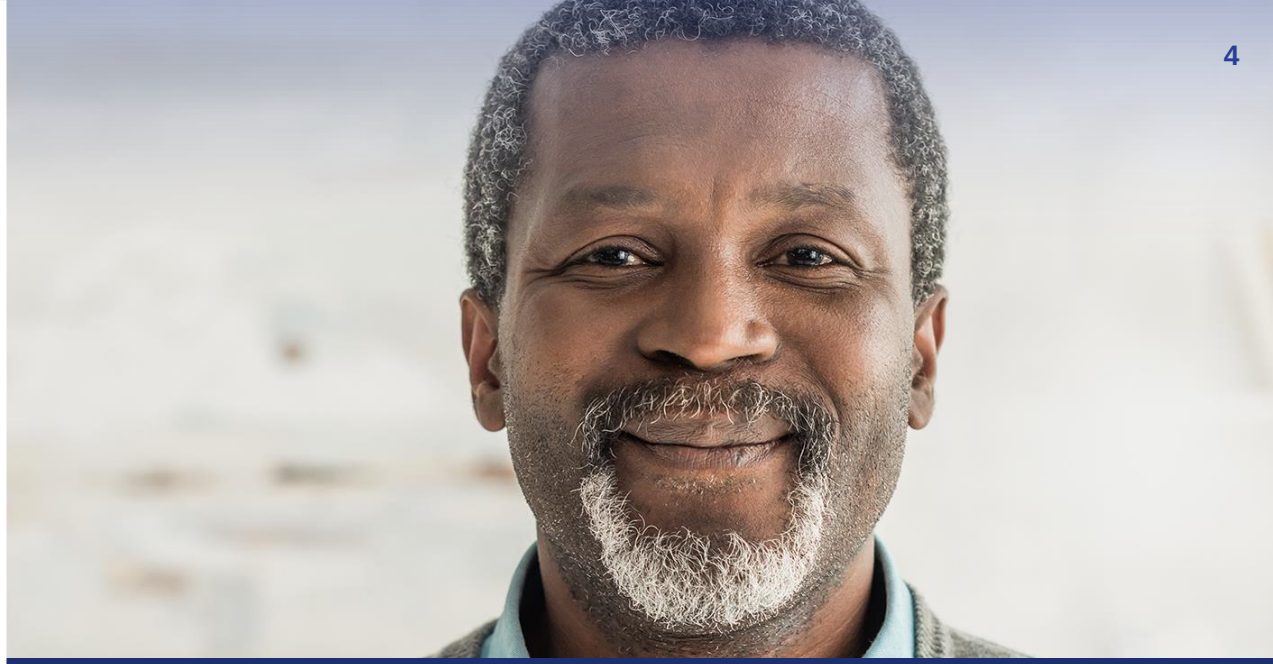
Neuroscience

Symptoms from stress-related behaviors

BXCL501 Programs

- Schizophrenia-related agitation
- Bipolar Disorder-related agitation
- Dementia (Alzheimer's disease)-related agitation
- Major Depressive Disorder (MDD)



Immuno-Oncology

Innate Immunity

BXCL701 Programs

- Aggressive form of prostate cancer
- Advanced solid tumors

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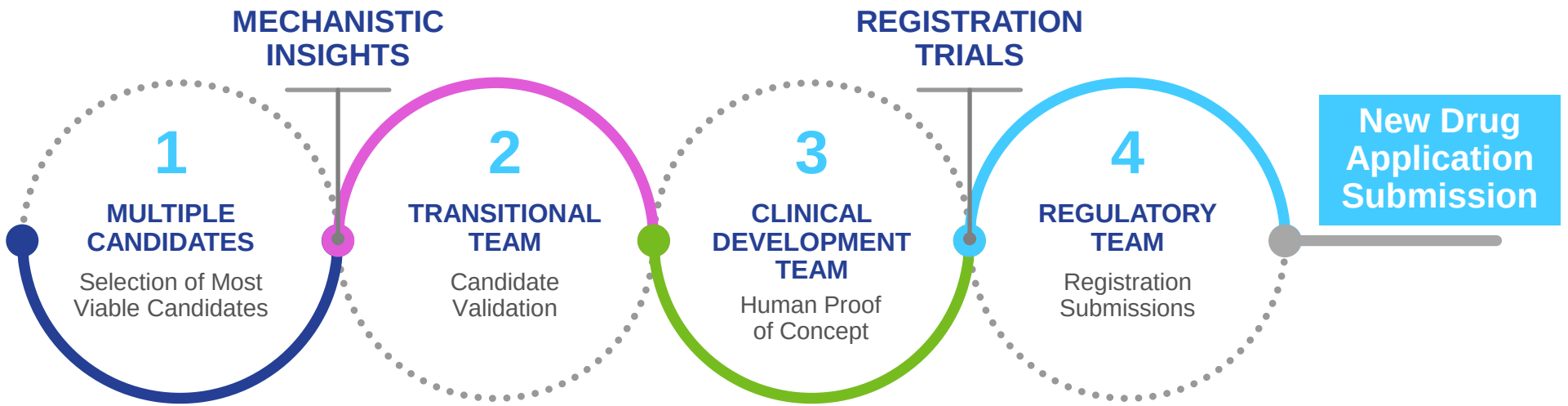
Accelerating the Development Cycle through AI



AI-based Drug Development

POTENTIAL TO:

- Optimize R&D Economics
- Shorten Development Timelines
- Achieve Greater Probability of Success

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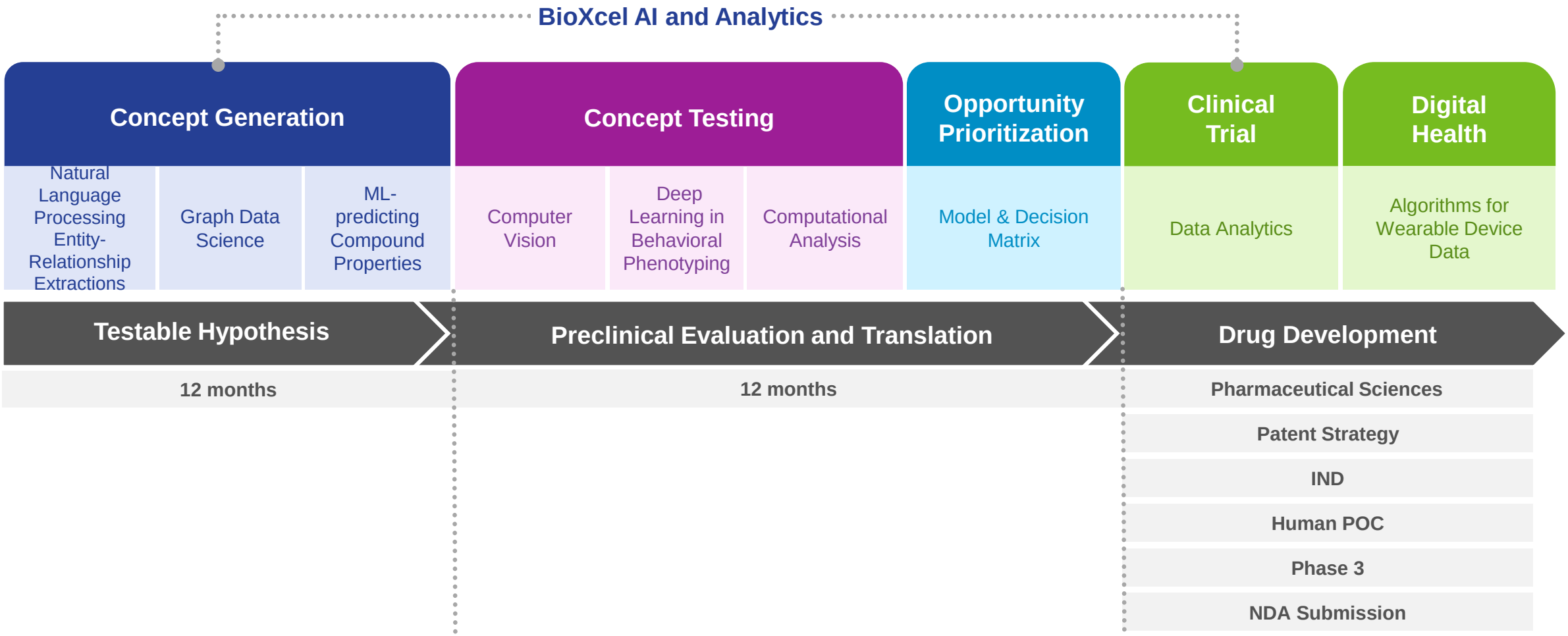
Drug Re-Innovation Process

From Product Concept to First-in-Human



Our Pipeline

Neuroscience

BXCL501	
Acute Treatment of Agitation Associated with Schizophrenia and Bipolar Disorders I and II	**SERENITY I & II Trials Completed (PDUFA date – 4/5/22)**
Acute Treatment of Agitation in Patients with Dementia (Alzheimer's Disease)	**BTD Phase 3 Program Initiation Planned**
Major Depressive Disorder (MDD)	**Ph1b/2 Trial Planned**
KalmPen™ (Single-use IM)	
Severe acute agitation	**Formulation Development**
BXCL502	
Chronic Treatment of Agitation in Patients with Dementia	**Formulation Development**
Wearable Device (+BXCL501)**	
Pre & post-agitation in dementia	**Feasibility Study Planned**

Immuno-oncology

BXCL701	
Metastatic castration-resistant prostate cancer (small cell neuroendocrine carcinoma and adenocarcinoma)	**Phase 1b/2 (Combination with KEYTRUDA®)**
Basket trial – hot and CPI resistant tumors (investigator-initiated study led by MD Anderson Cancer Center)	**Phase 2 (Combination with KEYTRUDA®)**

**Regulatory path to be determined; device + drug combination to be evaluated after further evaluation of predictive algorithm
Opioid withdrawal symptoms with BXCL501 pending NIDA grant decision
Agitation in delirium study with BXCL501 is on voluntary pause

Pipeline as of December 1, 2021

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BXCL501

Proprietary, Orally Dissolving Thin Film Formulation of Dexmedetomidine

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Neuroscience Strategy

From First-in-Human Trial to NDA Filing Acceptance for BXCL501 in Under 3 Years

Utilizing a robust AI platform to develop transformative medicines

Focusing on hard-to-treat neuropsychiatric symptoms by delineating underlying human biology and behavioral pathways

Leveraging re-innovation of clinical (NCEs) candidates and approved drugs

Delivering long-term stakeholder value through sustainable R&D pipeline

Agitation: Debilitating for Patients and Threatening for Healthcare Providers

A Common and Difficult-to-Manage Symptom

- **A common occurrence in most neuropsychiatric disorders**
- **Characterized by recurring episodes requiring frequent treatments**
- **Over 150M people globally with schizophrenia, bipolar disorder, dementia, delirium and opioid use disorder[1]**
- **Over 13M patients in the U.S.[1] experience agitation within these disease areas**
  - More than 200M agitation episodes per year in the U.S.[1]
  - Multi-billion-dollar healthcare burden
- **Current treatment options are suboptimal**
  - Physically restraining patients
  - Over-sedating therapies such as antipsychotics and benzodiazepines
  - Antipsychotic drugs have black box warnings for elderly
- **BXCL501 has the potential to offer a novel mechanism and a highly differentiated approach**

[1]Internal company estimates

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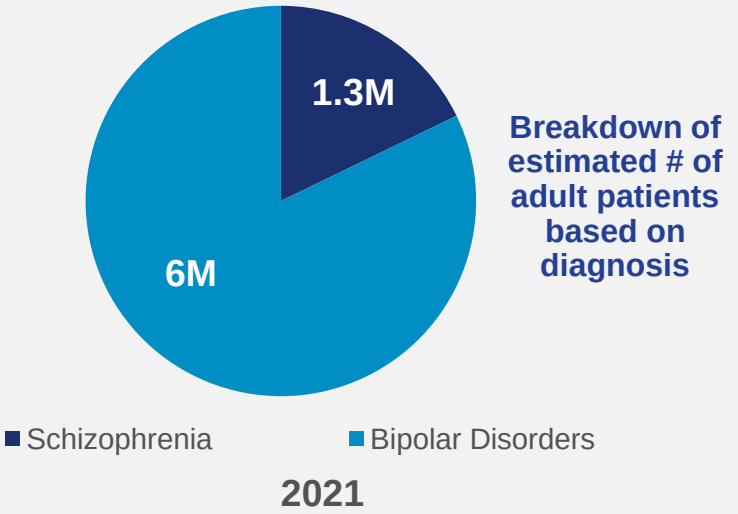
Significant Commercial Potential in Multiple Indications

Schizophrenia & Bipolar Disorders

Prevalence among adults ≈ 9M[1,2]

Diagnosed prevalence among adults ≈ 7.3M[1, 2]



Breakdown of estimated # of adult patients based on diagnosis

~ 25M agitation episodes per year based on diagnosed prevalence in the U.S.[3]

Dementia

Americans 65+ with Alzheimer's Disease[2] to double by 2040[4]

Estimated Number of U.S. Patients with Agitation

Approximately 100M agitation episodes per year in the U.S.[6]

Sources: 1. Wu, 2006, NAMI; 2. Prevalence of bipolar disorder in adults. November 2017. Accessed June 24, 2021. https://www.hcp.med.harvard.edu/ncs/ftpdir/NCS-R_12-month_Prevalence_Estimates.pdf
3. Estimate based on company market research; 4. Alzheimer's Association; 5. Tractenberg, R Neuropsychiatry Clin Neuroscience 14:1 Winter 2002; 6. Estimate based on company market research

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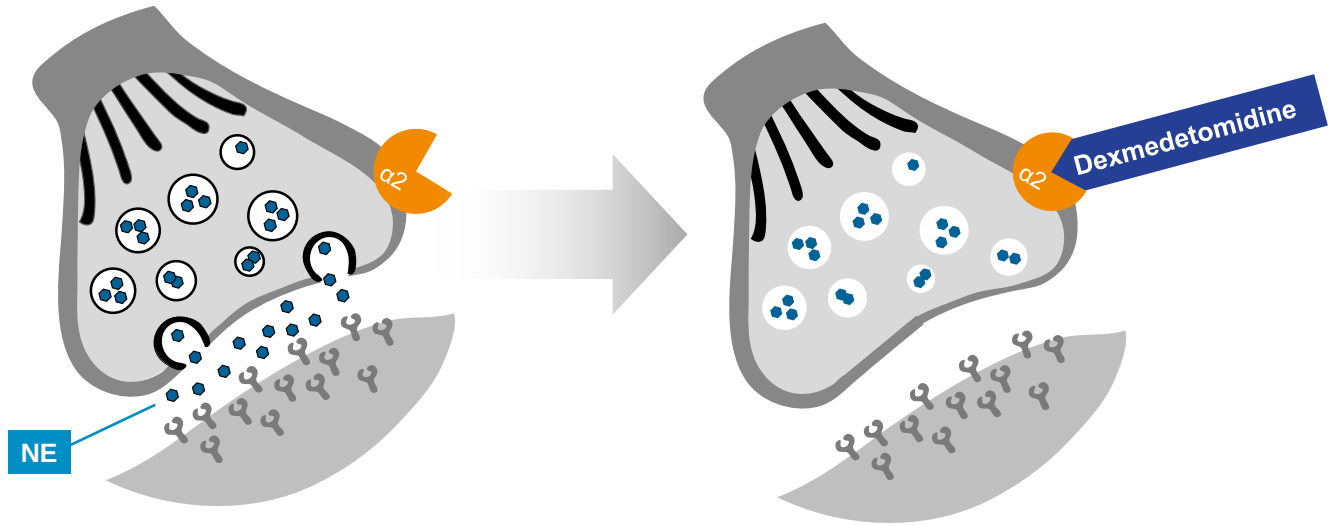
BXCL501: Novel Mechanism Potentially Targets Causal Agitation

Positive Results from Numerous Trials Support Underlying MoA

Dexmedetomidine MoA



(+) Agitation

(-) Agitation

Norepinephrine (NE)

Highly Differentiated from Current Treatments

- Easy-to-administer thin film, sublingual or buccal
- Non-invasive
- Non-traumatic
- Self-administered by patients

Expanding Patent Portfolio

- U.S. patent (No. 10,792,246) issued; IP protection expected until 2039
- Japanese patent (No. 6868698) directed to methods of treating agitation; expires no earlier than 2037
- Japanese design patent (No. 1681960) directed to film design; expires no earlier than 2045
- Multiple patent applications pending

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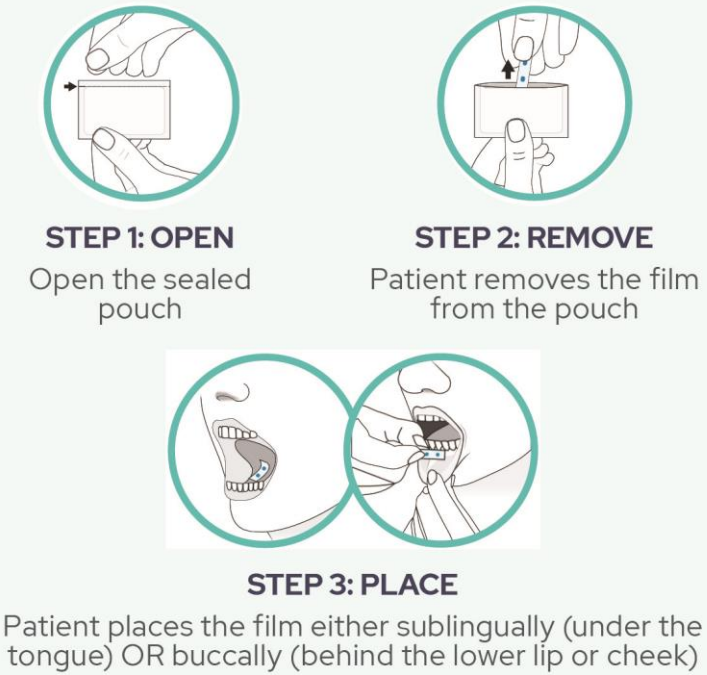
Patients Successfully Self-Administered Film in Trials



Proprietary, Orally Dissolving, Sublingual or Buccal Thin Film Formulation

- Muco-adhesion properties designed for optimizing compliance
- Designed to be administered behind lower lip or under tongue
- Adaptable technology enables broad dose range
- Flexible for potential combination of multiple drugs on a single film

Transitioned to Commercial Scale-Up Process

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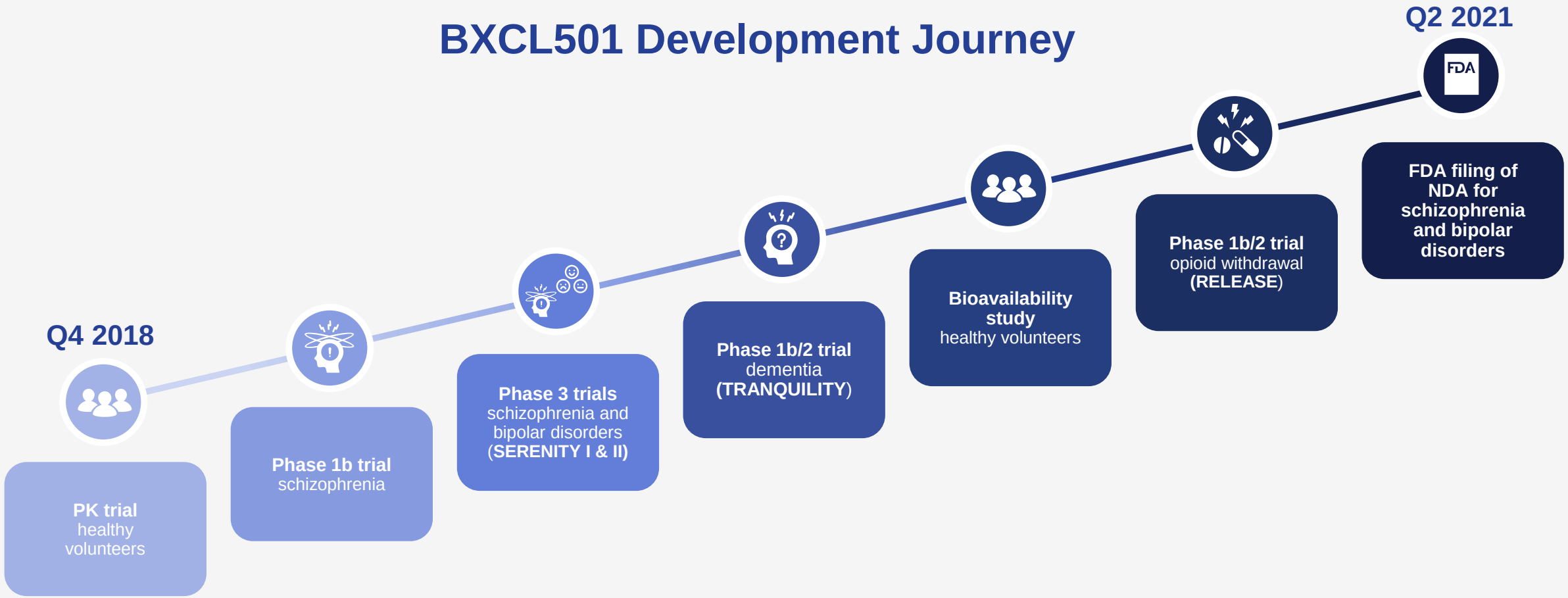
Conducted 7 Trials Across a Range of Disorders in >800 Subjects

Generally Well Tolerated in Trials Across Three Distinct Indications



Positive Results Observed in Patients with Schizophrenia and Bipolar

FDA Fast Track Designation

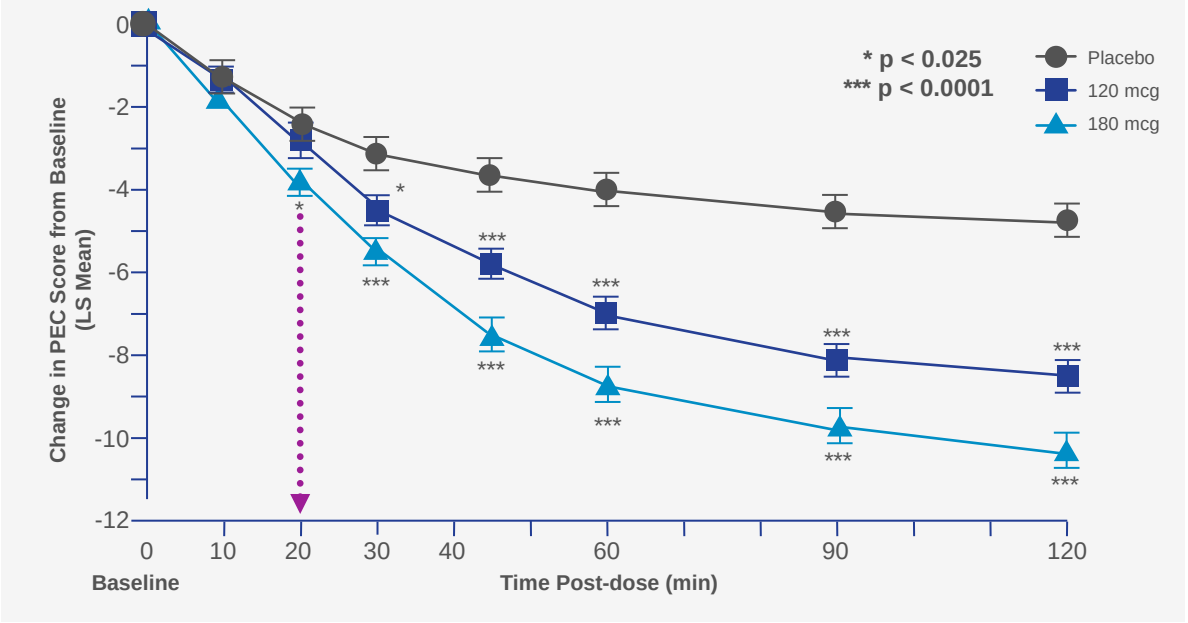
for the acute treatment of agitation associated with schizophrenia and bipolar disorders I & II

- **Clinically meaningful, rapid and durable reductions in agitation measures**
  - Onset of action in PEC total score observed as early as 20 minutes
  - Response in PEC total score lasted at least 8 hours after treatment *(exploratory endpoint)*
- **High response rate (~90%) across both populations at 180 mcg dose**
- **BXCL501 was well tolerated with no severe or serious adverse events**

NDA Accepted for filing; PDUFA action date of April 5, 2022

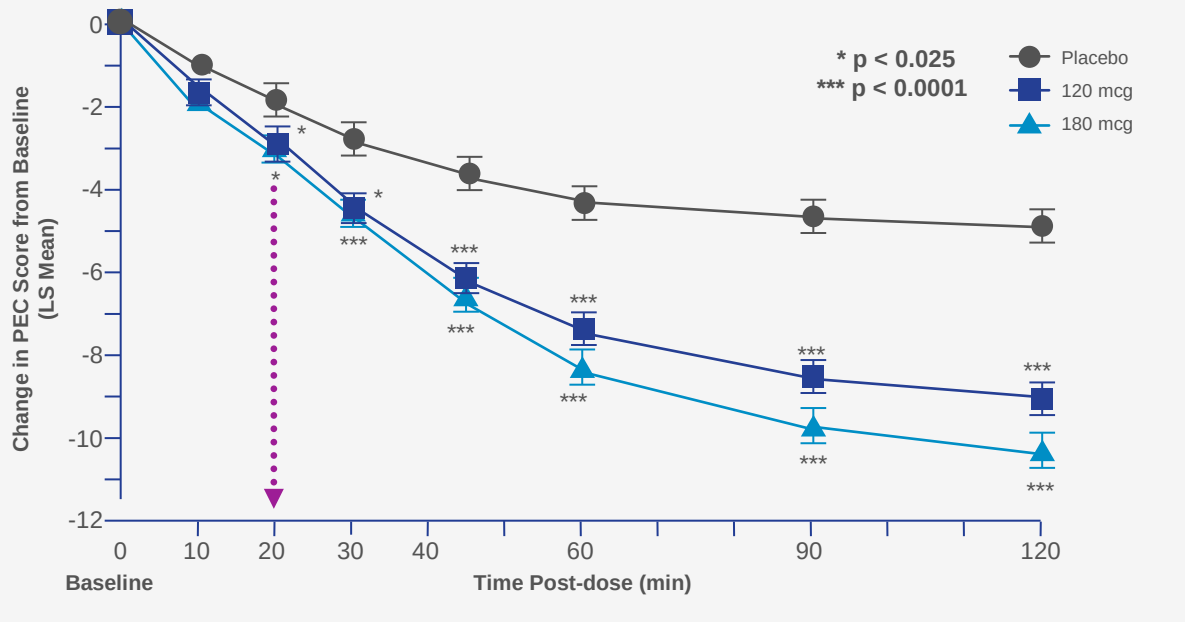
Rapid Onset of Action and Durable Response Observed

SERENITY I: Change in PEC Score from Baseline



Endpoint (120 min)	Placebo	120 mcg	180 mcg
PEC Total score Change from Baseline	-4.8	-8.5 ***	-10.3 ***
Response °	34%	79.1% ***	88.8% ***

SERENITY II: Change in PEC Score from Baseline



Endpoint (120 min)	Placebo	120 mcg	180 mcg
PEC total score change from Baseline	-5.0	-9.1 ***	-10.4 ***
Response °	37%	77.0% ***	90.5% ***

ITT analysis, Least Square Means +/-SEM
° Proportion achieving ≥ 40% PEC reduction

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BXCL501 Commercial and Launch Readiness Progress

Medical Affairs

- Fully deployed Medical Science Liaison and Medical Managed Care Teams
- Actively engaged with healthcare professionals and payers to inform/support potential BXCL501 commercial launch
- Ongoing participation and presentations at leading conferences

Commercial

- Expanded sales leadership: onboarded a Vice President of Sales and Regional Sales Directors; continuing to recruit sales force across key territories
- Optimizing market access and pricing strategy for BXCL501 through evidence-based market research
- Fully launched unbranded disease education campaign (Including partnersincalm website)

Commercialization Outside U.S.

- Intend to partner in Europe and Japan

Significant Improvement Demonstrated in Dementia-Related Agitation

FDA Breakthrough Therapy Designation

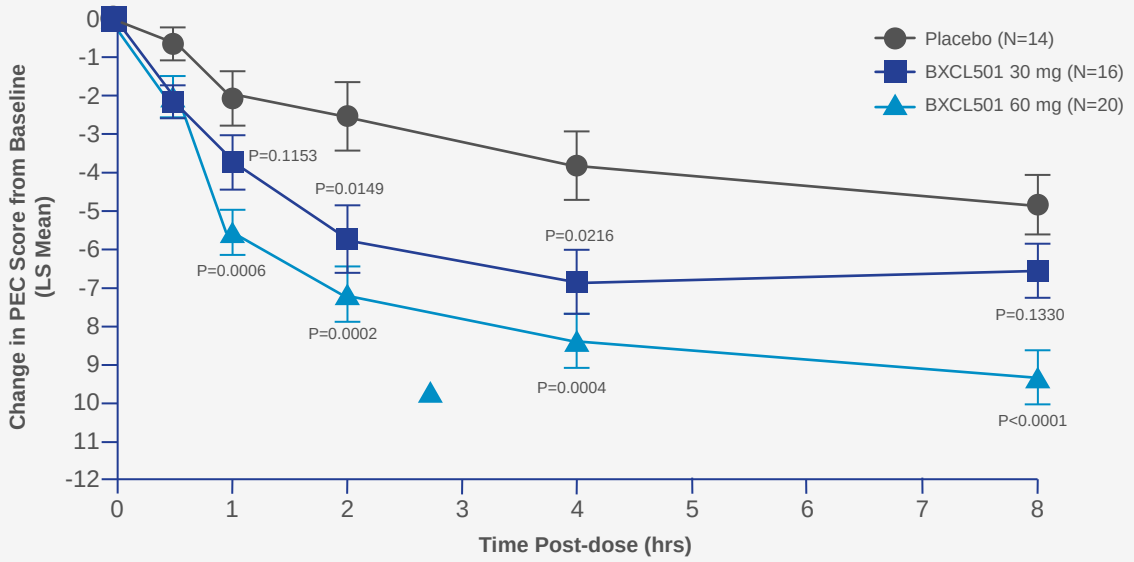
for the acute treatment of agitation associated with dementia

- **Statistically significant reductions in agitation achieved at 2 hours post-dose with both 30 and 60 mcg cohort as measured by the PEC, PAS and Mod-CMAI scales, with:**
  - Numerical separation as early as 30 min in PEC score, with significant reductions from baseline observed at 60 min in PEC & PAS scores
  - Duration of response lasted 8 hours after treatment with 60 mcg dose
  - All exploratory endpoints demonstrated significant reductions in agitation with 60 mcg dose
- **BXCL501 was well tolerated with no severe or serious adverse events**
- **Higher exposure levels observed in elderly dementia patients potentially enable lower doses**

Phase 1b/2 results support initiation of pivotal program for BXCL501 in dementia

Clinically Meaningful, Rapid and Durable Response Observed

Change in PEC Score from Baseline

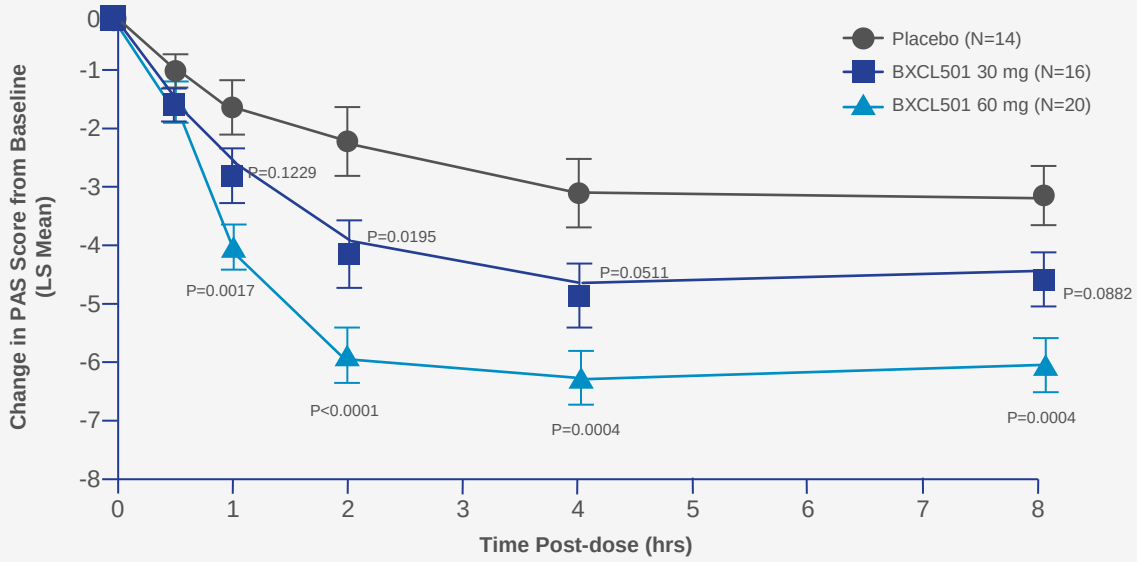


P values at 0.5 hrs are 0.0295 for BXCL501 30 mcg and 0.0568 for BCXL501 60 mcg

	Placebo	BXCL501 30 mcg	BXCL501 60 mcg
Change from Baseline at 120 mins (LS Mean)	-2.5	-5.7	-7.1
Response °	0%	31%	70%

PANSS-Excitatory Component (PEC) is a 5 items scale: Excitement, Hostility, Tension, Uncooperativeness, Poor Impulse Control, rated 1-Absent to 7-Extreme
ITT analysis, Least Square Means ± SEM
° Proportion achieving ≥ 40% PEC reduction

Change in PAS Score from Baseline



P values at 0.5 hrs are 0.3.162 for BXCL501 30 mcg and 0.2631 for BCXL501 60 mcg

	Placebo	BXCL501 30 mcg	BXCL501 60 mcg
Change from Baseline at 120 mins (LS Mean)	-2.2	-4.1	-5.9

Pittsburgh Agitation Scale (PAS) measures 4 behavior groups: aberrant vocalization, motor agitation, aggressiveness, and resisting to care rated 0- no agitation present to 4 – highest form of agitation.
ITT analysis, Least Square Means ± SEM

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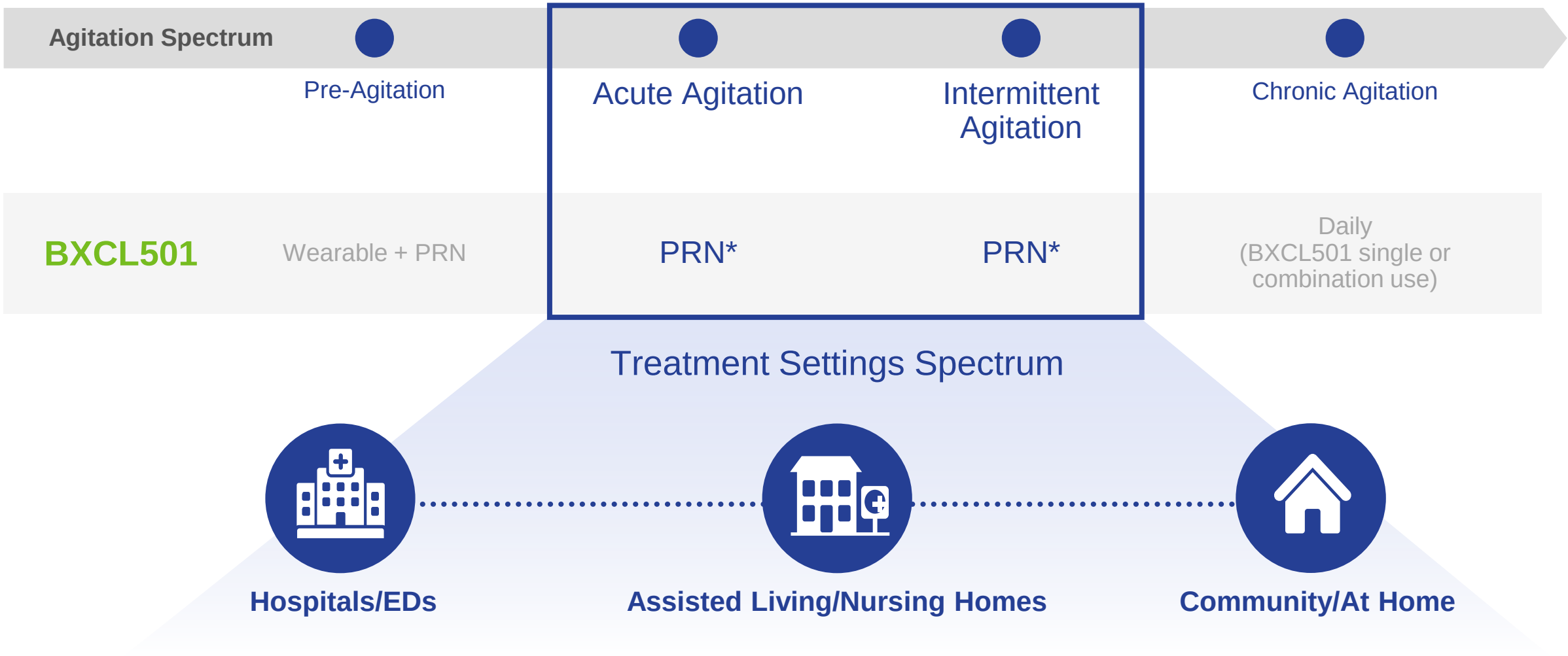
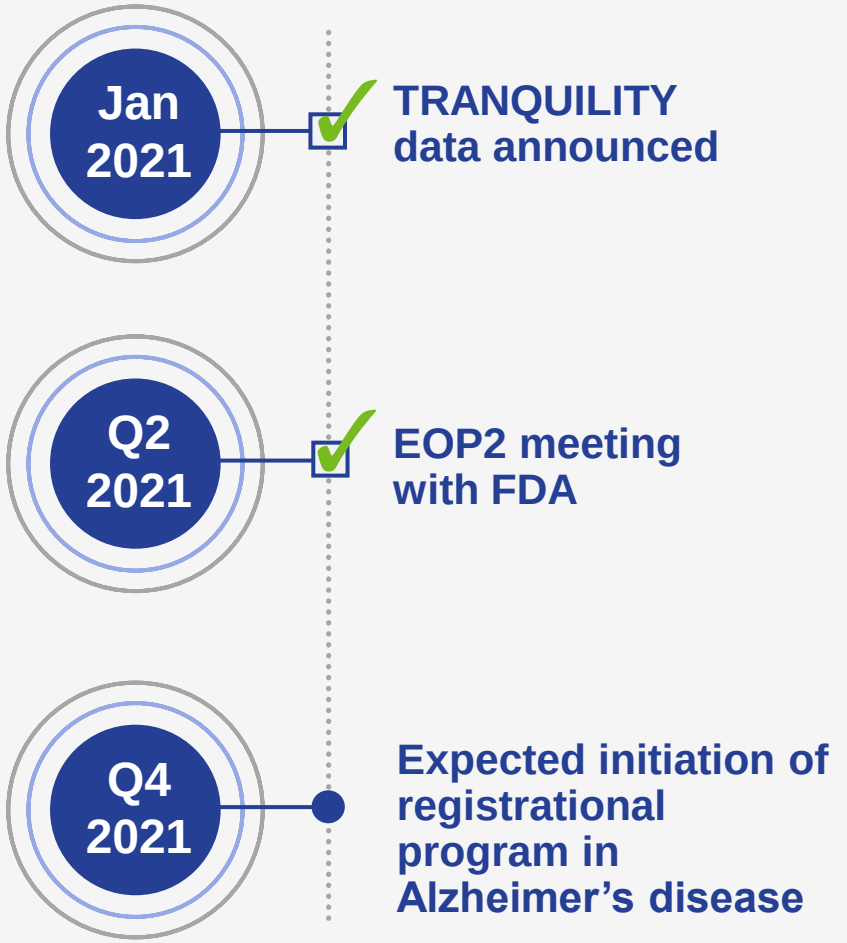
Dementia Program Comprehensive Strategy



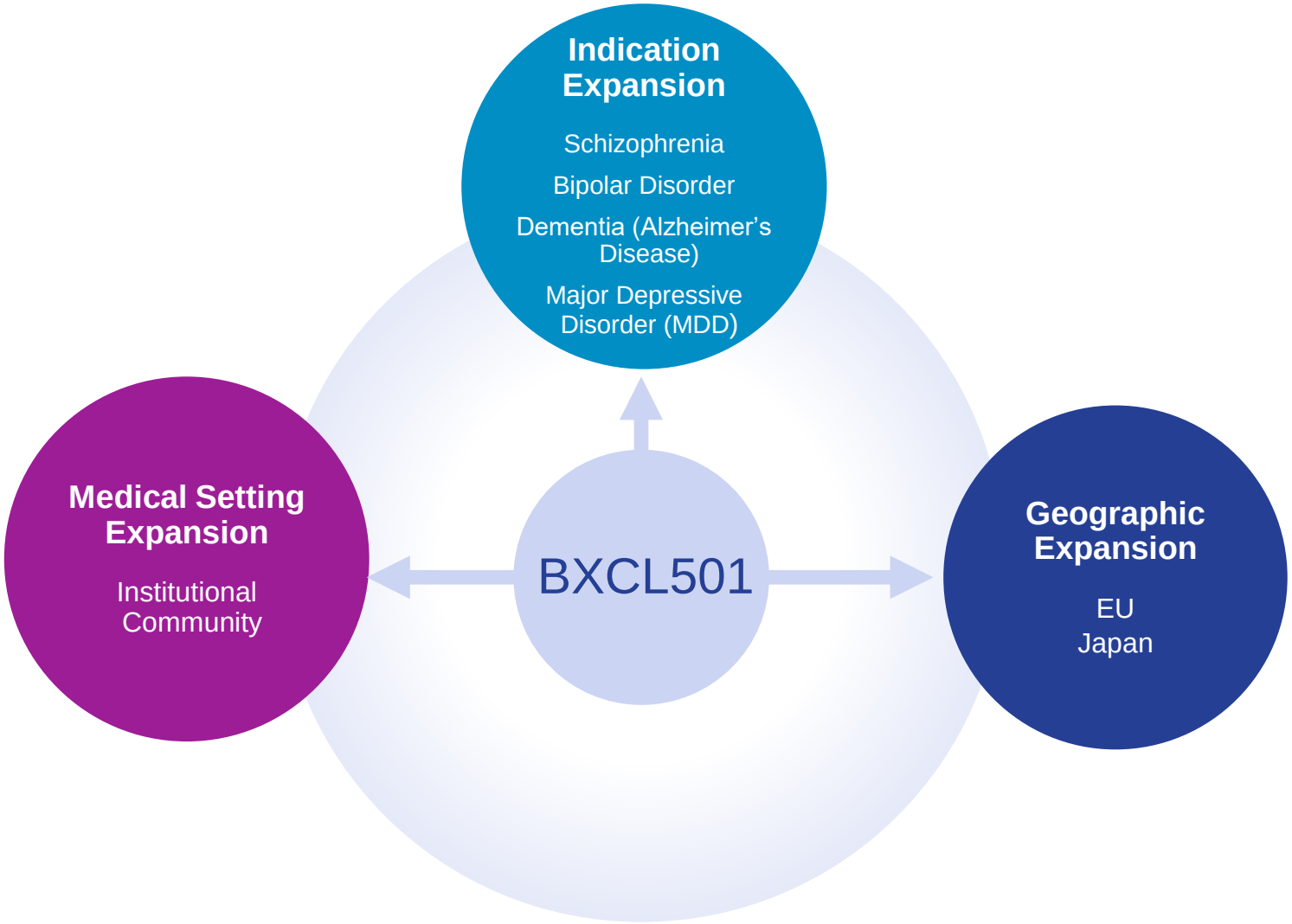
*As needed

Plans for Registrational Studies in Dementia (Alzheimer's Disease)

- End of Phase 2 meeting with FDA held in Q2 2021 with additional meetings completed in Q4 2021 on key design features of Phase 3 program in Alzheimer's disease
- Expected initiation of registrational program in Q4 2021



Significant Portfolio Expansion Opportunity for BXCL501



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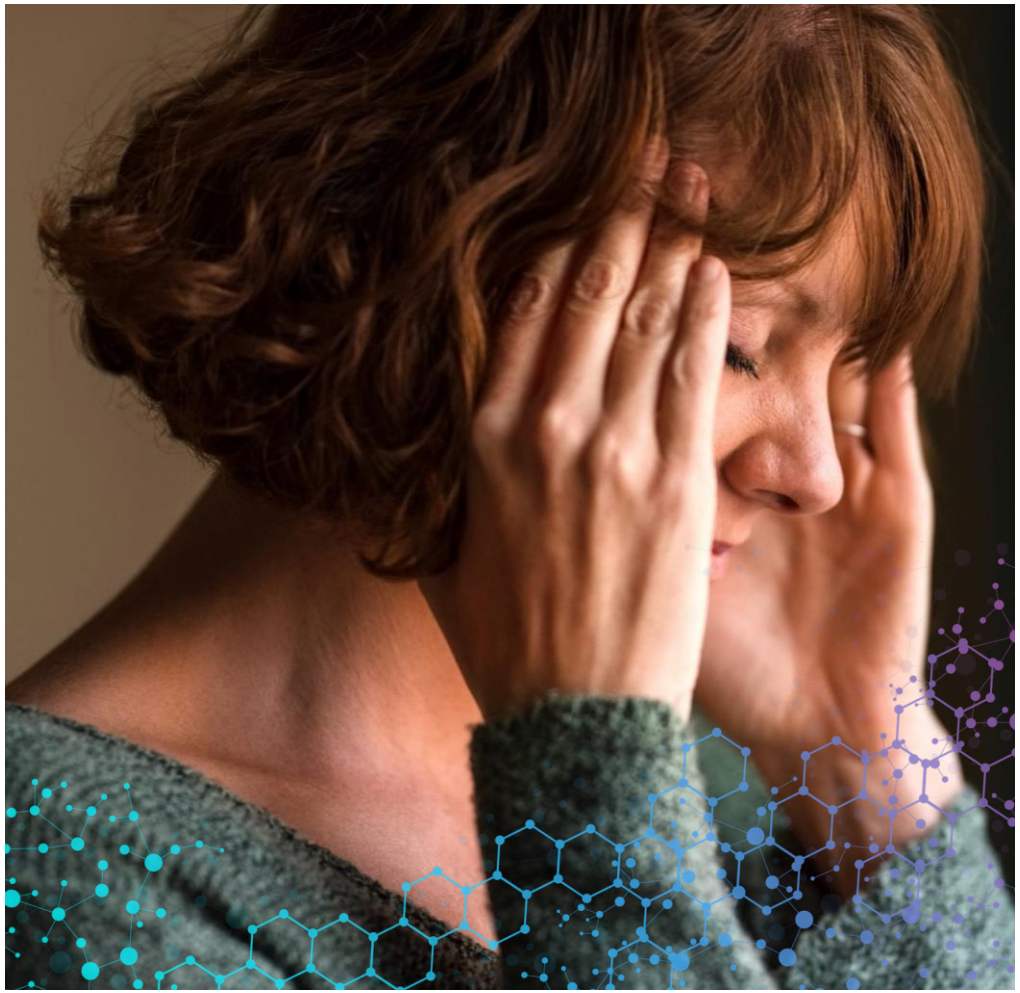
BXCL501 Program for Potential Adjunctive Treatment of Patients with Major Depressive Disorder (MDD)

New Insights from our Proprietary Clinical Data (SERENITY I and II, RELEASE)

- **Post-hoc analyses suggested potential to address** sympathetic hyperarousal with BXCL501
- **BXCL501 demonstrated consistent** reductions in anxiety measures in bipolar patients in depressed mode
- **Clinical evidence supports** further development of BXCL501 in MDD



BXCL501 as a Potential Adjunctive Treatment in MDD

Planned MAD Study

HV

- Healthy volunteers, dosed daily
- **Objectives:** Assess safety, tolerability of daily doses of BXCL501

MDD Patients

- Depressed patients, dosed daily
- **Objectives:** Assess safety and tolerability in patients

Planned POC Trial in Depression

BXCL501 + SSRI

Placebo + SSRI

- Enroll patients with major depressive episode treated with SSRI or SNRI
- 4- to 6- week double blind, placebo-controlled parallel group trial
- **Objective:** Assess antidepressant efficacy and safety of daily BXCL501

Meeting with FDA held in Q4 2021 on key design features of MDD program

Preparing to submit IND and expect to initiate a clinical trial in 1H 2022

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BXCL502

Investigational, Oral Dissolving Tablet

BXCL502 for Chronic Treatment of Agitation in Patients with Dementia (Monotherapy)

Potential Mechanism of Action
Potent and selective antagonist for a GPCR target that affects serotonergic signaling in the cerebral cortex

Confidence in Rationale
Observed activity in two animal models

Patient Exposure
Hundreds of patients exposed to the compound for 52 weeks

Previous Efficacy Findings
Previously demonstrated improvement in a clinically validated scale used for agitation in 3 clinical studies (secondary endpoint)

Status
BXCL502 formulation and clinical development planning underway

BXCL502: Designed to be a Differentiated Candidate

Pathway	✓ High expression in brain on pathways associated with stress response
Confidence and Rationale	✓ Robust confidence in rationale, based on preclinical studies that showed comparable activity to benzodiazepines and antidepressants
Efficacy Results	✓ Showed improvement in clinically validated endpoint for neuropsychiatric symptoms related to agitation
Human Safety	✓ Generally well-tolerated in hundreds of patients after 52 weeks of dosing
Patent Strategy	✓ Novel formulation strategy under development ✓ Opportunities to expand IP position in combination with complementary mechanisms

Potential for combination therapy with BXCL501

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BXCL701

Investigational Oral IO Therapy

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Designed to stimulate the innate immune system

Designed to facilitate a strong adaptive anti-cancer immune response to potentially:

- Expand activity of immune agents into cold tumors
- Reverse resistance in checkpoint-treated hot tumors
- Augment responses in checkpoint naïve hot tumors

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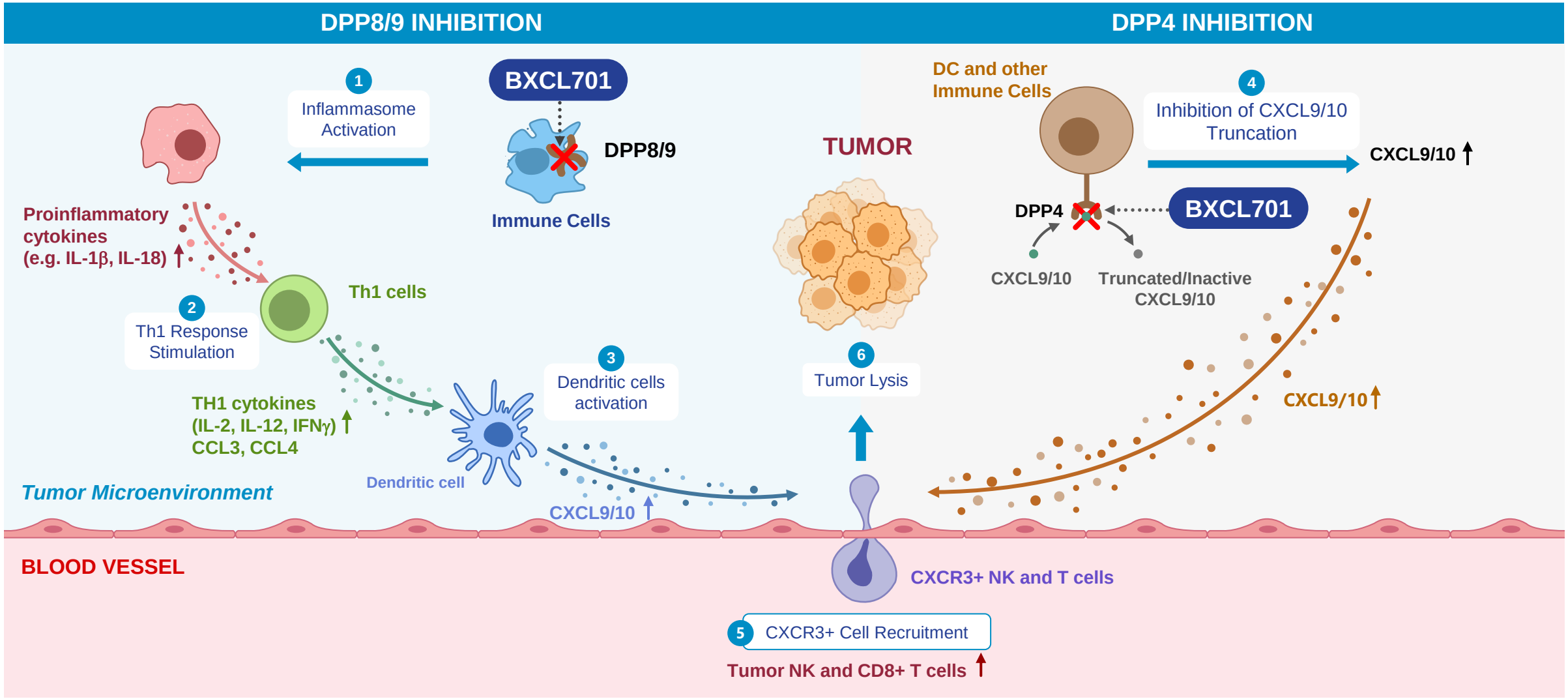
BXCL701 Designed to Modulate Tumor Microenvironment by Activating Innate Immunity Followed by Adaptive Immunity Leading to Cancer Cell Death



BXCL701 Clinical Development Strategy

Encouraging signals of activity observed in difficult-to-treat tumors in both trials

1

metastatic Castration-Resistant Prostate Cancer — adenocarcinoma and small cell neuroendocrine carcinoma (Cold Tumors):

Phase 1b/2 trial of BXCL701 and KEYTRUDA®

- Safety & initial efficacy data presented at ESMO 2021

2

Relapsed Solid Tumors (Hot Tumors) — 2 cohorts, naïve and resistant to CPIs*:

Open-label Phase 2 basket trial of BXCL701 and KEYTRUDA®; investigator-initiated study led by MD Anderson Cancer Center

- Safety & initial efficacy data presented at ASCO 2021

Efficacy data readout expected in 1Q 2022

Plans to present results at major medical conferences

* CPI: Check Point Inhibitors

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BXCL701 + KEYTRUDA > KEYTRUDA Alone

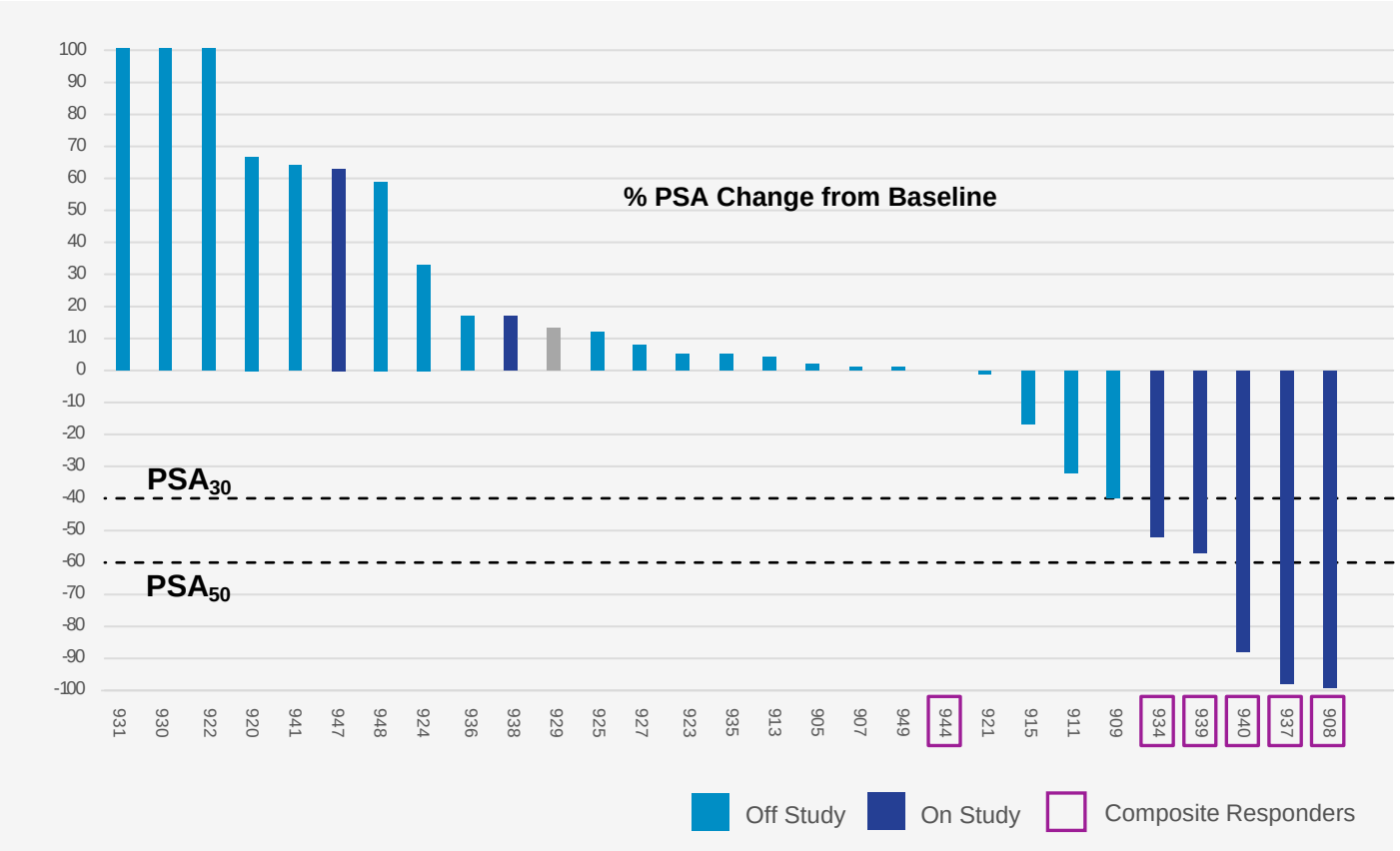
- All patients pre-treated with ≥1 line of TAXANE chemotherapy
- 59% enrolled patients pre-treated with 2 androgen signaling inhibitor
- 31% pre-treated with PROVENGE (sipuleucel-T)

BXCL701 26% composite response rate

- 16% RECIST-defined PR
- 63% Disease control rate (PR + SD + non-CR / non-PD)
- 17% PSA_{50} including 3 patients with PSA drop ~90%

KEYTRUDA single agent historic data[1]*

- Objective response rate ~5%
- Disease control rate 12%
- PSA_{50} response 6%



Oral BXCL701 + pembrolizumab demonstrated encouraging anti-tumor activity in heavily pre-treated, refractory mCRPC patients with adenocarcinoma phenotype

[1] Antonarakis et al. "Pembrolizumab for Treatment-Refractory Metastatic Castration-Resistant Prostate Cancer: Multicohort, Open-Label Phase II KEYNOTE-199 Study." *Journal of Clinical Oncology* 38, no. 5 (February 10, 2020) 395-405. DOI: 10.1200/JCO.19.01638.

**FOR ILLUSTRATIVE PURPOSES ONLY: no head-to-head studies have been conducted comparing BXCL701 to pembrolizumab as a single agent. Differences exist between trial designs and subject characteristics, and caution should be exercised when comparing data across studies.*

Interim data as of Aug. 23, 2021

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Interim Phase 2 Safety Results in Adenocarcinoma Population

Treatment Emergent Adverse Events	N = 32 n (%)			
Subjects with any TEAE	**27 (84)**			
AE related to BXCL701 or pembrolizumab	**10 (31)**			
SAE related to BXCL701 or pembrolizumab	**2 (6)**			
AE Preferred Term	**Grade 1**	**Grade 2**	**Grade 3**	**Total**
Fatigue	3	2	-	**5**
Hypotension*	3	1	-	**4**
Pruritus and Rash	4	-	-	**4**
Dizziness	-	2	1	**3**
Arthralgia/Myalgia	-	2		**2**
Oedema peripheral	1	-	-	**1**
Dehydration		1	-	**1**
Vomiting	-	1	-	**1**
Decreased appetite	1	-	-	**1**
Decreased lymphocyte count	-	1	-	**1**
Blood lactic acid increased	-	-	1	**1**
Pyrexia	1	-	-	**1**
Cytokine Release Syndrome	-	1	-	**1**

- Treatment-related adverse events (AEs) generally low-grade and consistent with side effect profiles of each agent
- Most comment AEs included fatigue (16%), hypotension (13%), and pruritus and rash (13%)
- No apparent exacerbation of anti-PD-1 toxicity

*Includes orthostatic hypotension

Interim data as of July 8, 2021

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What's Ahead

Key Clinical and Commercial Catalysts for 2021

Strong cash position $252.9M* to fund key milestones**

NEUROSCIENCE – BXCL501

Schizophrenia & Bipolar:

- ✓ NDA submitted in March 2021
- ✓ NDA accepted for filing – PDUFA date of 4/5/2022
  - MAA submission to EMA anticipated in 1H 2022

Dementia/Alzheimer's Disease***:

- ✓ Reported positive topline results from TRANQUILITY Phase 1b/2 trial
- ✓ TRANQUILITY 40 mcg supplemental cohort study underway
- ✓ EOP2 meeting with FDA held in Q2 2021
- ✓ Additional meetings held in Q4 2021 on key design features of Phase 3 program
- ✓ Expected initiation of registrational program in Alzheimer's disease in Q4 2021

Opioid Withdrawal Symptoms:

- ✓ Reported topline results for RELEASE Phase 1b/2 trial

COMMERCIAL STRATEGY

Commercial and Launch Readiness Preparations

- ✓ Optimizing market access and pricing strategy through evidence-based market research
- ✓ Launched disease education campaign
- ✓ Onboarded and expanded sales leadership
  - Sales Force recruitment

IMMUNO-ONCOLOGY – BXCL701

Aggressive Form of Prostate Cancer (cold tumor):

- ✓ Met prespecified efficacy bar in ongoing adenocarcinoma and neuroendocrine Phase 1b/2 trial
  - More complete efficacy and safety data will be presented at a medical conference expected in Q1 2022

Solid Hot Tumors – Basket Trial:

- ✓ Efficacy data readout expected 1H 2022

*Reported cash position as of Sept. 30, 2021
**Pipeline as of Dec. 1, 2021
***Acute treatment of agitation in dementia patients with Alzheimer's disease

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“We are passionate about bringing innovative medicines to patients in neuroscience and immuno-oncology.”

Vimal Mehta, Ph.D.
Chief Executive Officer & Founder

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