ASARINA PHARMA

Remain in control of your life

A phase II neurology company

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- Against the background of these uncertainties readers should not rely on forward-looking statements
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Asarina Pharma – Highlights

- On track to complete clinical development of a first therapeutic solely focused on Menstrual Migraine (MM)
  - Menstrual migraine – topline results Q2 2021
  - Annual ww peak sales of Sepranolone USD 800-900 mio in MM

- Phase IIa study with an efficacious compound but without side effects for treatment of Tourette
  - Tourette Syndrome – topline results Q2-Q3 2022
  - Potential ww peak sales > USD 1.0 bill in Tourette

- Team of very experienced biotech executives

- A scientific advisory board of world class experts in neurology and women's health

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The Asarina Team

Peter Nordkild, CEO

MD
Novo Nordisk, Ferring, Egalet, Pharmexa

Jakob Dynnes Hansen, CFO

MSc, MBA
Novo Nordisk Zealand Pharma
Evolva, Nordea

Karin Ekberg, COO

PhD
Clinical physiology
Creative Peptides Umecrine Cognition

Märta Segerdahl, CMO

MD, PhD
Astra Zeneca
Lundbeck

Otto Skolling, CBO

MSc
Pharmacia & Upjohn
Siemens Medical, Novozymes, Karolinska Development

Sven Göthe, CMC

PhD
Pharmacia & Upjohn
Kabi Fresenuis

The Asarina Scientific Advisory Board

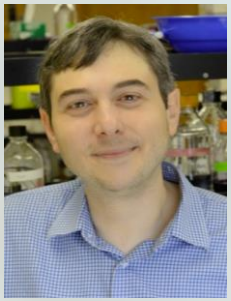
World Leading KOLs

Torbjörn Bäckström

Chairman
Senior Professor, Department of Clinical Science, Obstetrics and Gynecology, Umeå University (SE)

Anne MacGregor

Menstrual Migraine
Professor, specialist in Headache and Womens Health, London School of Medicine and Dentistry (UK)



Marco Bortolato

Tourette's Syndrome
Associate Professor, Department of pharmacology and toxicology, University of Utah (US)

Neill Epperson

Psychiatric Diseases
Professor of Psychiatry, School of Medicine, Univ. of Pennsylvania (US)

Guenther Deuschl

Neurological Diseases
Professor of Neurology, Chairman of the Department of Neurology Institution, Christian-Albrechts-Universität zu Kiel (Germany)

Marie Bixo

Premenstrual Dysphoric Disorder
Professor in Obstetrics and Gynaecology, Umeå University (SE)

Major shareholders

+50% are institutional investors

Kurma Biofund (France)	16.8%
Östersjöstiftelsen (Sweden)	14.2%
Idinvest Patrimonie (France)	8.7%
Fourth Swedish National pension fund	8.5%
Handelsbanken Fonder (Sweden)	3.9%
CEO & Founder	3.1%
Others (incl. +3000 private shareholders)	44.8%
Total	**100.0%**

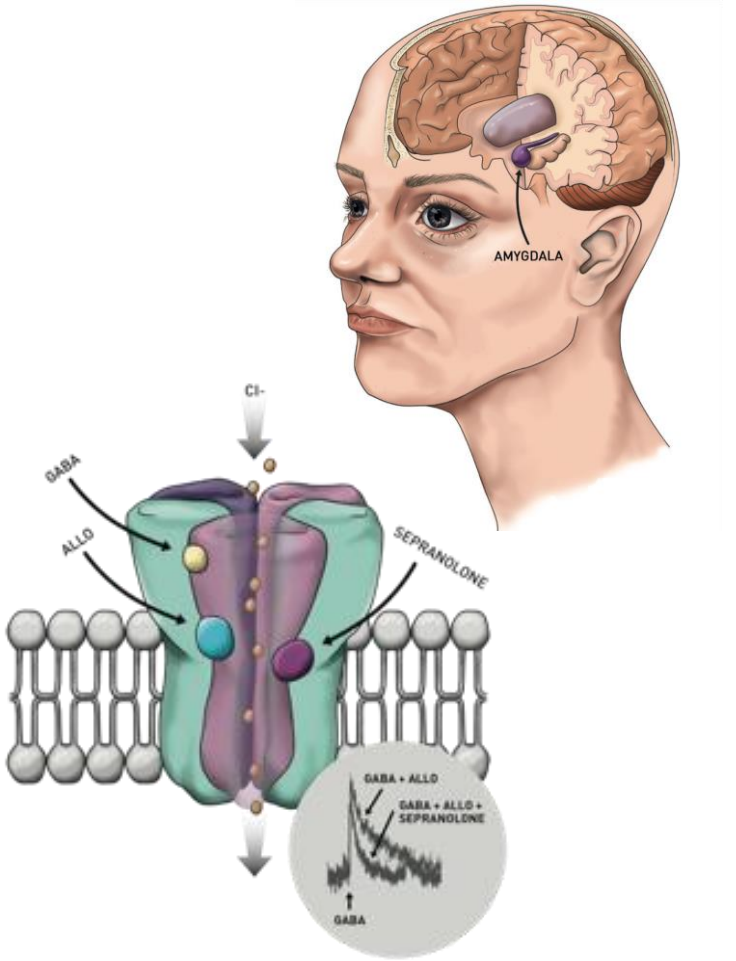
30 june 2020

Sepranolone works via the GABA receptor in the brain; the brain's 'brake' system

GABA is the brain's most powerful inhibitory neurotransmitter, reducing stress, fear and anxiety levels.

GABA acts in the brain's GABA-A receptors — having a major impact on our lives, modulating our emotions, reward and pleasure centers, and emotional, cognitive and memory functions.

GABA-A receptors are a fast-emerging, high-potential therapeutic target. Asarina Pharma has researched them for over 40 years.



AMYGDALA. *The amygdala plays a crucial role in processing emotional responses. Inside the amygdala, neurons use the neurotransmitter GABA (gamma-aminobutyric acid) to modulate feelings such as fear, anxiety and agreession. The GABA system is the brain's primary inhibitory neurotransmitter.*

Strömberg et al, Neuroscience 2006
Lundgren et al, Brain Research 2003

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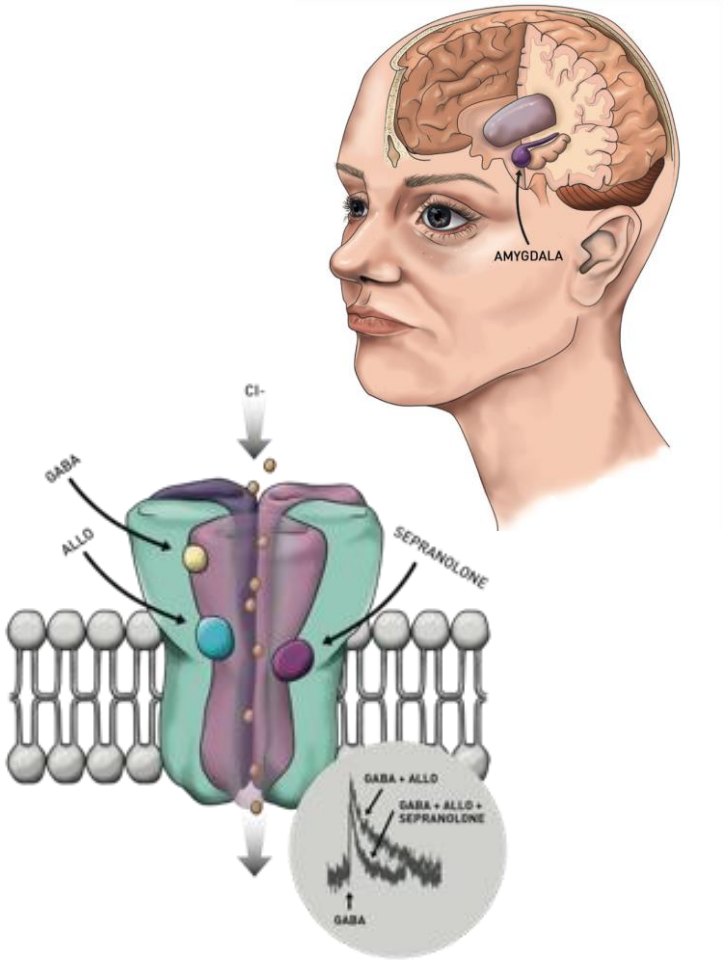
ALLO & GABA-A: the brain's 'brake' system

ALLO (or Allopregnanolone) is the most powerful of the neurosteroids active within and targeting the GABA-A receptors.

ALLO modulates GABA in the GABA-A receptor, helping reduce stress, fear and anxiety.

But, ALLO also has powerful sedative and analgesic properties and may increase the effects of tranquilizers, sedatives and alcohol.



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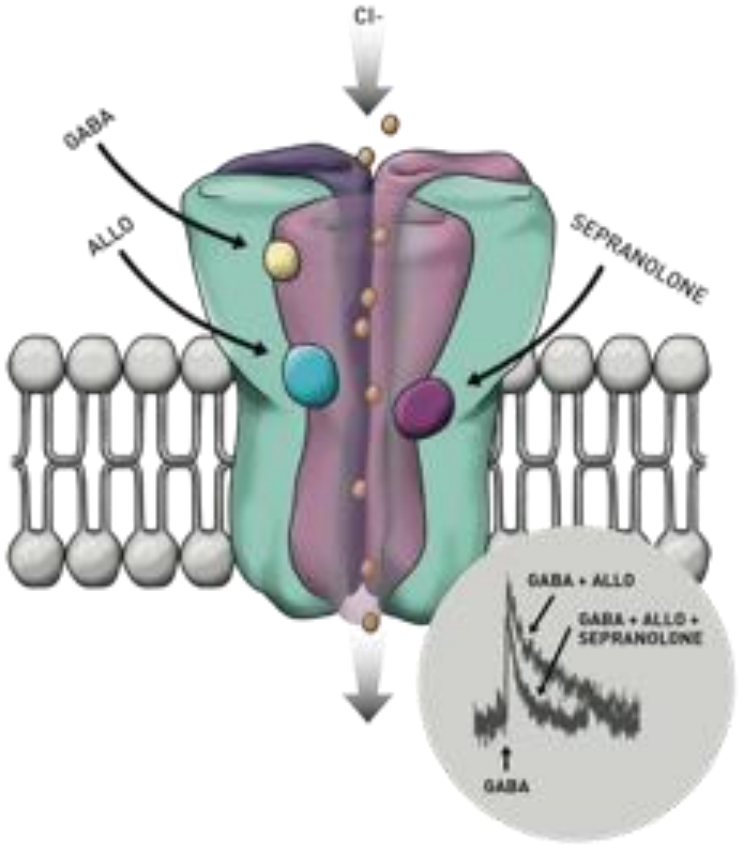
The ALLO Paradox

For a sizeable minority of people though—ALLO has the exact opposite effect.

For them ALLO produces *increased* anxiety and stress, severe mood- and personality-altering symptoms and even triggers powerful, irresistible compulsions.



Strömberg et al, Neuroscience 2006
Lundgren et al, Brain Research 2003

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To balance ALLO levels and neutralize its negative effects, the brain produces an endogenous compound, isoallopregnanolone, that resets the GABA-A Receptor to normal.

Asarina Pharma is the first company to develop and synthesize isoallopregnanolone as a medication - **Sepranolone**.

Sepranolone was patented as a pharmaceutical formulation in 2010, after 40 years' research and development.

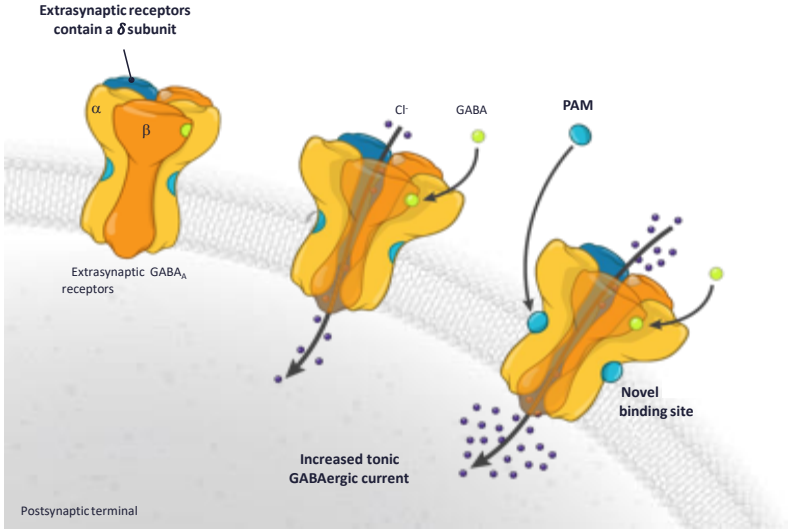
Sepranolone is the first of a new family of selective modulating compounds targeting the neurosteroids that act on the brain's GABA-A receptors.

These are called **GAMSAs.**

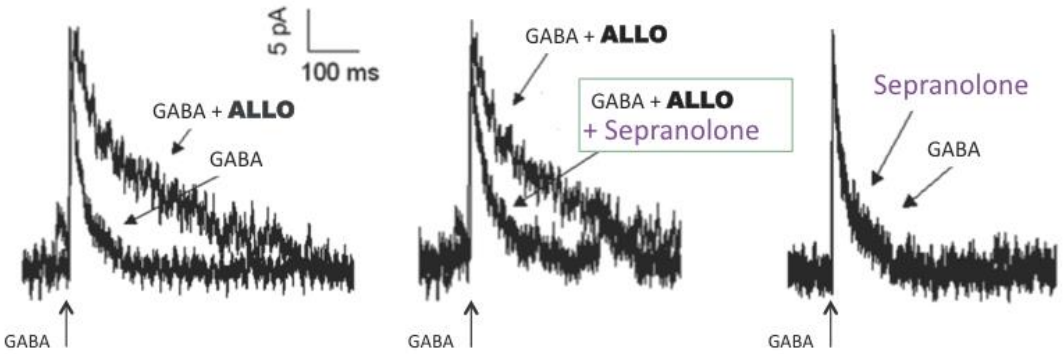
Selective, specific and safe, GAMSAs represent a paradigm shift in the treatment of stress- and compulsion-related conditions.

GAMSA selectivity: How Sepranolone inhibits ALLO in the $GABA_A$-Receptor

- The effect of GAMSAs is confined to a very specific subtype of the $GABA_A$ receptor resulting in minimal effect on any other CNS mechanism.
- The GAMSA Sepranolone, for example, inhibits the Positive Allosteric Modulation (PAM) effect of ALLO through
- Fine-tuned receptor activity without overstimulation
- High selectivity
- Minimal off-target effects



Electrical current (patch clamp experiment)



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Sepranolone in Menstrual Migraine

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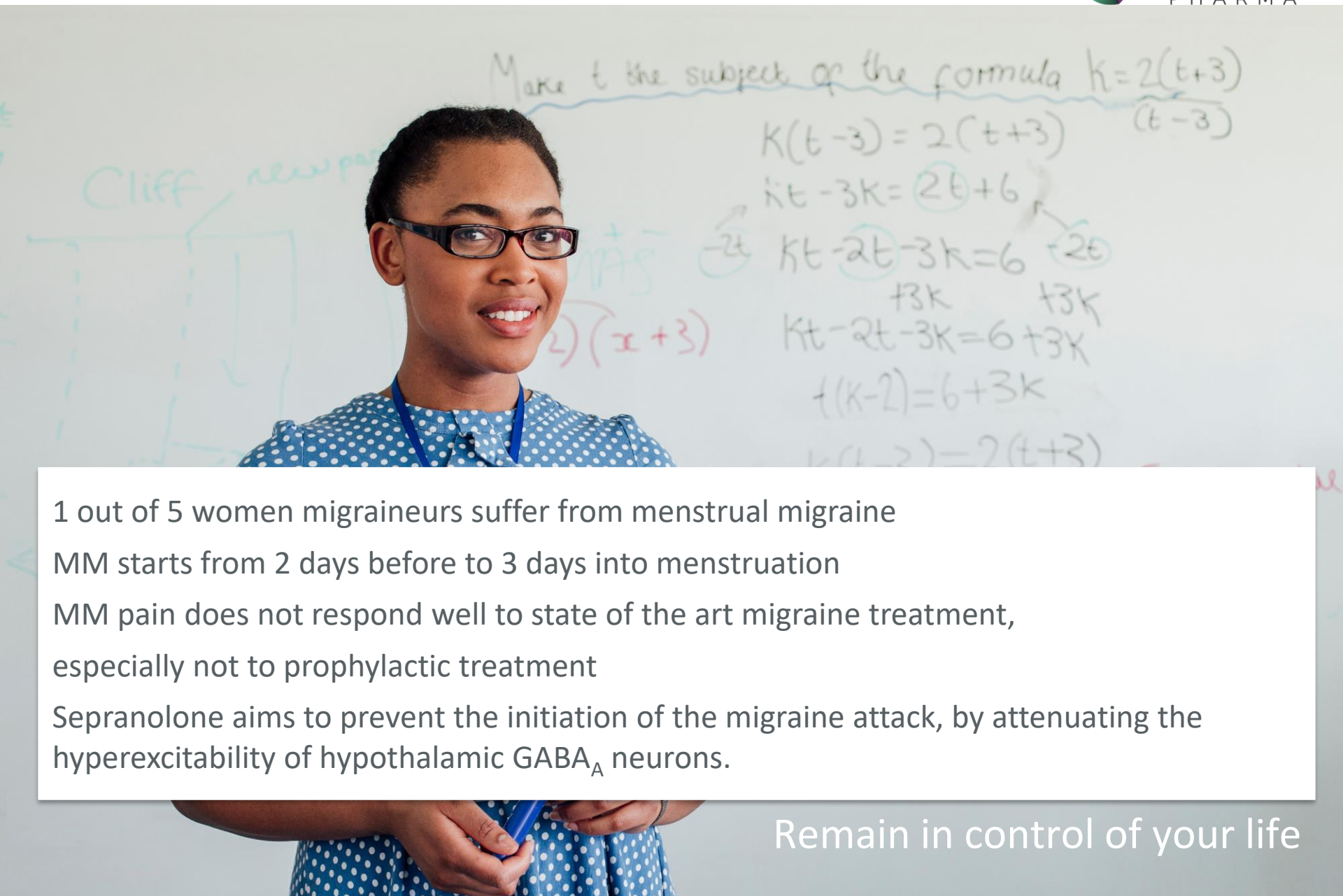


1 out of 5 women migraineurs suffer from menstrual migraine

MM starts from 2 days before to 3 days into menstruation

MM pain does not respond well to state of the art migraine treatment,

especially not to prophylactic treatment

Sepranolone aims to prevent the initiation of the migraine attack, by attenuating the hyperexcitability of hypothalamic $GABA_A$ neurons.

Remain in control of your life

Changes in circulating neurosteroid levels and in particular ALLO are associated with migraine

Koverech et al. The Journal of Headache and Pain (2019) 20:61
https://doi.org/10.1186/s10194-019-1005-0

The Journal of Headache and Pain

RESEARCH ARTICLE Open Access

Migraine and cluster headache show impaired neurosteroids patterns

Angela Koverech[1,2,10], Claudia Cicione[3], Luana Lionetto[3,9], Marta Maestri[1], Francesco Passariello[1], Elisabetta Sabbatini[1], Matilde Capi[4,9], Cristiano Maria De Marco[5], Martina Guglielmetti[5,6], Andrea Negro[1,5], Luisa Di Menna[7], Maurizio Simmaco[8,9], Ferdinando Nicoletti[7,10] and Paolo Martelletti[1,2,5*]

Table 2 Plasma neurosteroid levels in patients affected by episodic migraine patients and healthy controls

	Episodic migraine	Controls	*P*
AP (ng/mL)	1.3 ± 0.5	0.6 ± 0.3	< 0.01
EAP (ng/mL)	0.7 ± 0.2	0.4 ± 0.1	< 0.01
DHEA (ng/mL)	2.9 ± 1.5	5.1 ± 3.8	< 0.05
DHEAS (μg/mL)	2.4 ± 1.1	2.7 ± 2.0	n.s.

Values are means ± S.D. Statistical analysis was performed by Student's t test

Table 3 Plasma neurosteroid levels in patients affected by chronic migraine patients and healthy controls

	Chronic migraine (overall population)	Controls	*P*
AP (ng/mL)	1.1 ± 0.3	0.61 ± 0.3	< 0.01
EAP (ng/mL)	0.4 ± 0.2	0.41 ± 01	n.s.
DHEA (ng/mL)	1.6 ± 1.1	5.1 ± 3.8	< 0.01
DHEAS (μg/mL)	1.2 ± 0.9	2.76 ± 2.0	< 0.01

Values are means ± S.D. Statistical analysis was performed by Student's t test

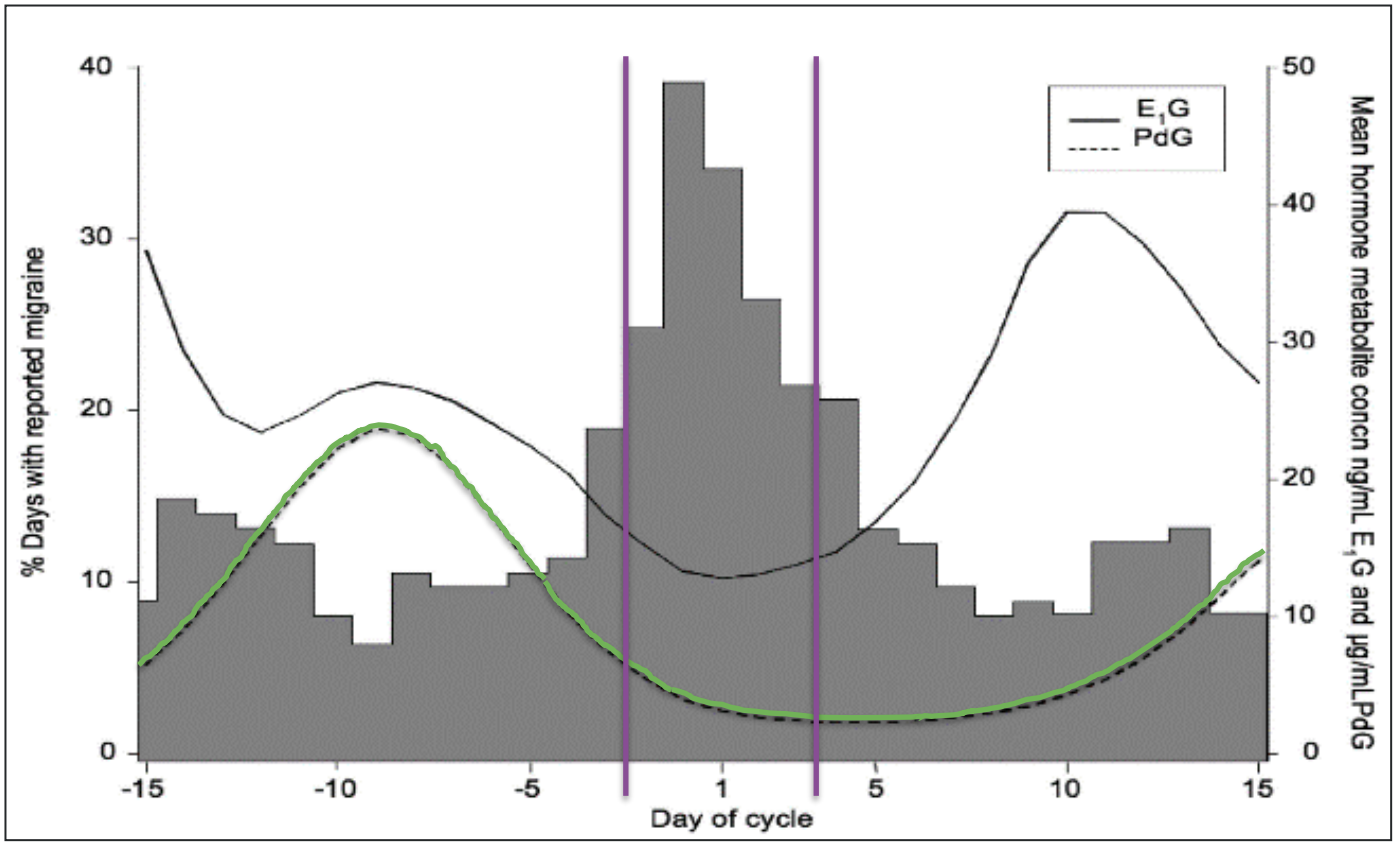
Table 5 Plasma neurosteroid levels in the overall population of patients affected by chronic migraine during the headache attack and in the interictal period

	Chronic migraine during attack ($n = 27$)	Chronic migraine no attack ($n = 24$)	Controls
AP (ng/mL)	1.1 ± 0.4*	1.1 ± 0.2*	0.6 ± 0.3
EAP (ng/mL)	0.5 ± 0.1	0.4 ± 0.2	0.4 ± 0.1
DHEA (ng/mL)	1.4 ± 0.9*	1.8 ± 1.2*	5.1 ± 3.8
DHEAS (μg/mL)	1.5 ± 1.1*	1.0 ± 0.6*	2.7 ± 2.0

Values are means ± S.D. *$p<0.05$ vs. the respective control groups. No significant changes were found between values obtained during the attack and in the interictal period. Statistical analysis was performed by One-way ANOVA + Fisher's LSD (AP, $F_{2,79} = 24.79$; EAP, $F_{2,79} = 1.43$; DHEA, $F_{2,79} = 18.06$; DHEAS, $F_{2,79} = 10.66$)

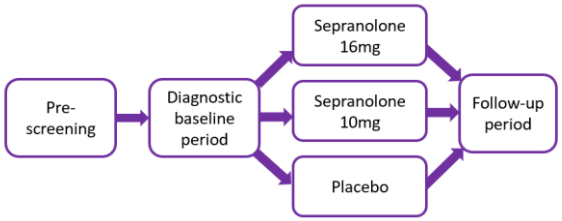
Migraine Attacks During the Menstrual Cycle

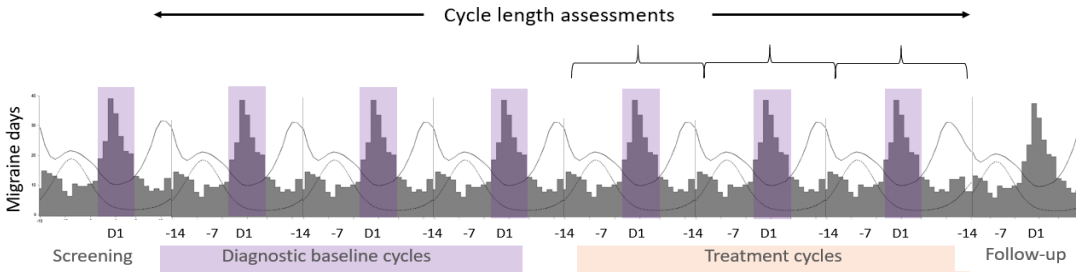
Menstrual exacerbation of migraine occurs
in ~ 50% of women with migraine



Incidence of migraine, urinary estrone-3-glucuronide (E1G) and pregnanediol-3-glucuronide (PdG) levels on each day of the menstrual cycle in 120 cycles from 38 women

Phase IIa Study in 150 women fully enrolled …….topline results in Q2 2021





- A randomized, double blind, parallel group study in women age 18-45 comparing two doses of Sepranolone and placebo.
- Estimated top line results in Q2 2021
- A diagnostic/baseline phase of three menstrual cycles followed by three cycles of Sepranolone treatment.
- Women self-administer Sepranolone every 48 hours during the luteal phase
- Primary endpoint is reduction from baseline in number of migraine days

MM – the last ”untreated” subsegment of Migraine

- Assumptions:
  > 6% of women suffer from Menstrual Migraine (~14.000.000)
  > 50% or 7 mio in EU/US/Japan seek treatment
  > 30% are refractory to present treatment

  - Sepranolone market introduction 2028
  - Sepranolone market penetration of 10% at peak sales
  - 200.000 patients being treated with Sepranolone

  - Annual Sepranolone pricing e.g. USD 6.000
    (Aimovig, Avojy, Emgality for Migraine: USD 6.900 annually)

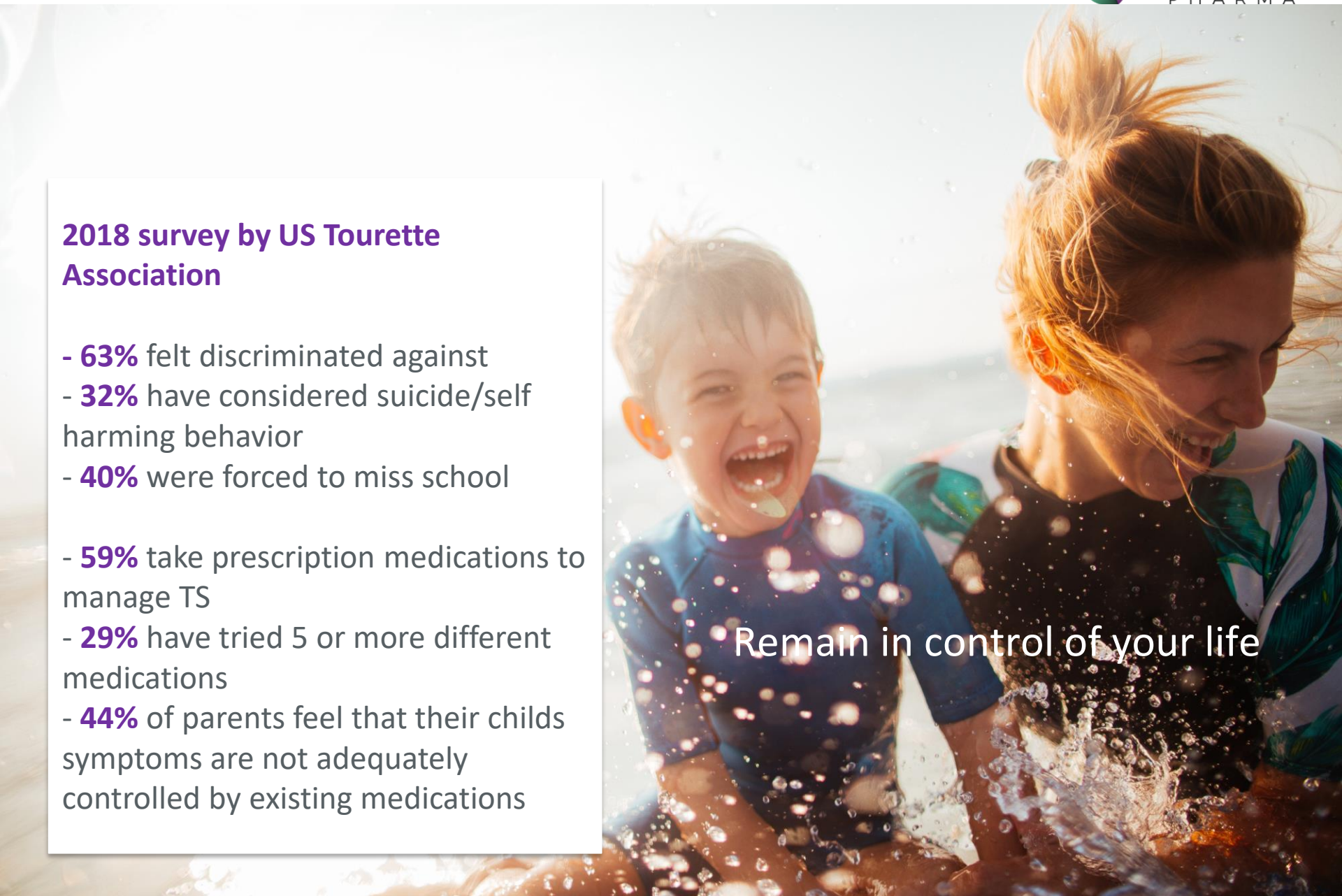
  - Annual ww peak sales of Sepranolone USD 800-900 mio

Sepranolone in children with Tourette

2018 survey by US Tourette Association

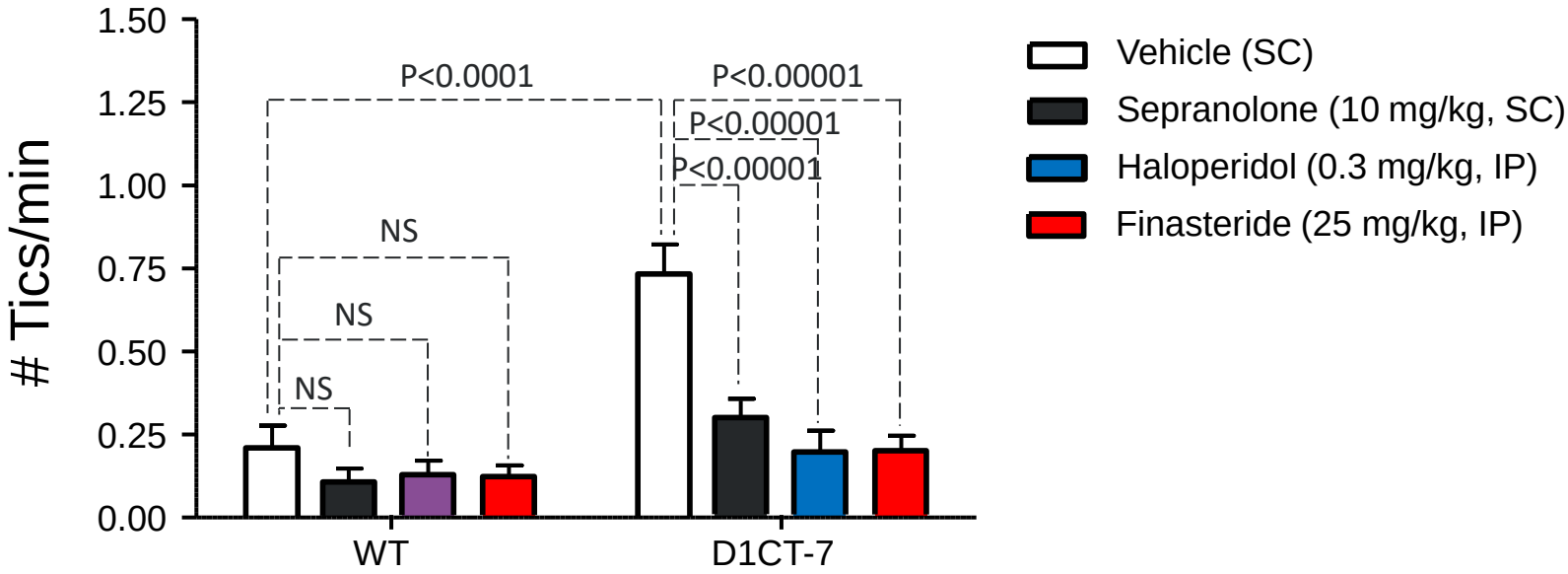
- **63%** felt discriminated against
- **32%** have considered suicide/self harming behavior
- **40%** were forced to miss school

- **59%** take prescription medications to manage TS
- **29%** have tried 5 or more different medications
- **44%** of parents feel that their childs symptoms are not adequately controlled by existing medications



High efficacy on par with Haldol and Finasteride

Spatial confinement experiment in mice

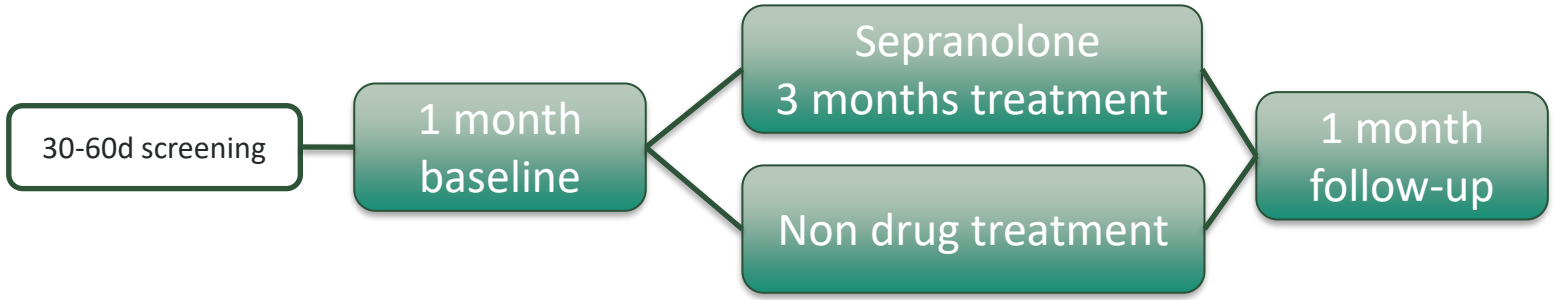


Source of Variation	**% of total variation**	**P value**	**P value summary**	**Significant?**	
Interaction	**16.23**	**<0.0001**	********	**Yes**	
Row Factor	**23.85**	**<0.0001**	********	**Yes**	
Column Factor	**33.18**	**<0.0001**	********	**Yes**	
ANOVA table	**SS (Type III)**	**DF**	**MS**	**F (DFn, DFd)**	**P value**
Interaction	**0.4598**	**3**	**0.1533**	**F (3, 48) = 9.716**	**P<0.0001**
Row Factor	**0.6754**	**1**	**0.6754**	**F (1, 48) = 42.82**	**P<0.0001**
Column Factor	**0.9398**	**3**	**0.3133**	**F (3, 48) = 19.86**	**P<0.0001**

All movements were scored by personnel blinded to treatment and genotype; n=7/group

Analysis: 2-way ANOVA followed by Tukey's post-hoc tests

Phase IIa Study in Tourette to be initiated in Q2 2021



- A randomized parallel group Phase IIa study in drug naive adolescent and adult patients with TS
- ~30 male and female TS patients, age 12-18, randomized to Sepranolone and non-drug treatment or non-drug treatment alone
- 1-month baseline period, whereafter patients will receive Sepranolone every other day for 3 months*
- Primary endpoint: reduction of tics on the YGTSS** scale
- Cut off: > 25% tic reduction

* Due to natural waxing and waning of tics, too short observation periods tend to overestimate effects

**Yale Global Tic Severity Scale (YGTSS) (McGuire et al 2018)

Market Opportunity Tourette

Assumptions

- 600.000 TS patients in US/EU/Japan
> 300.000 patients in US/EU/Japan treated with drugs

- pediatric orphan drug designation requested with FDA

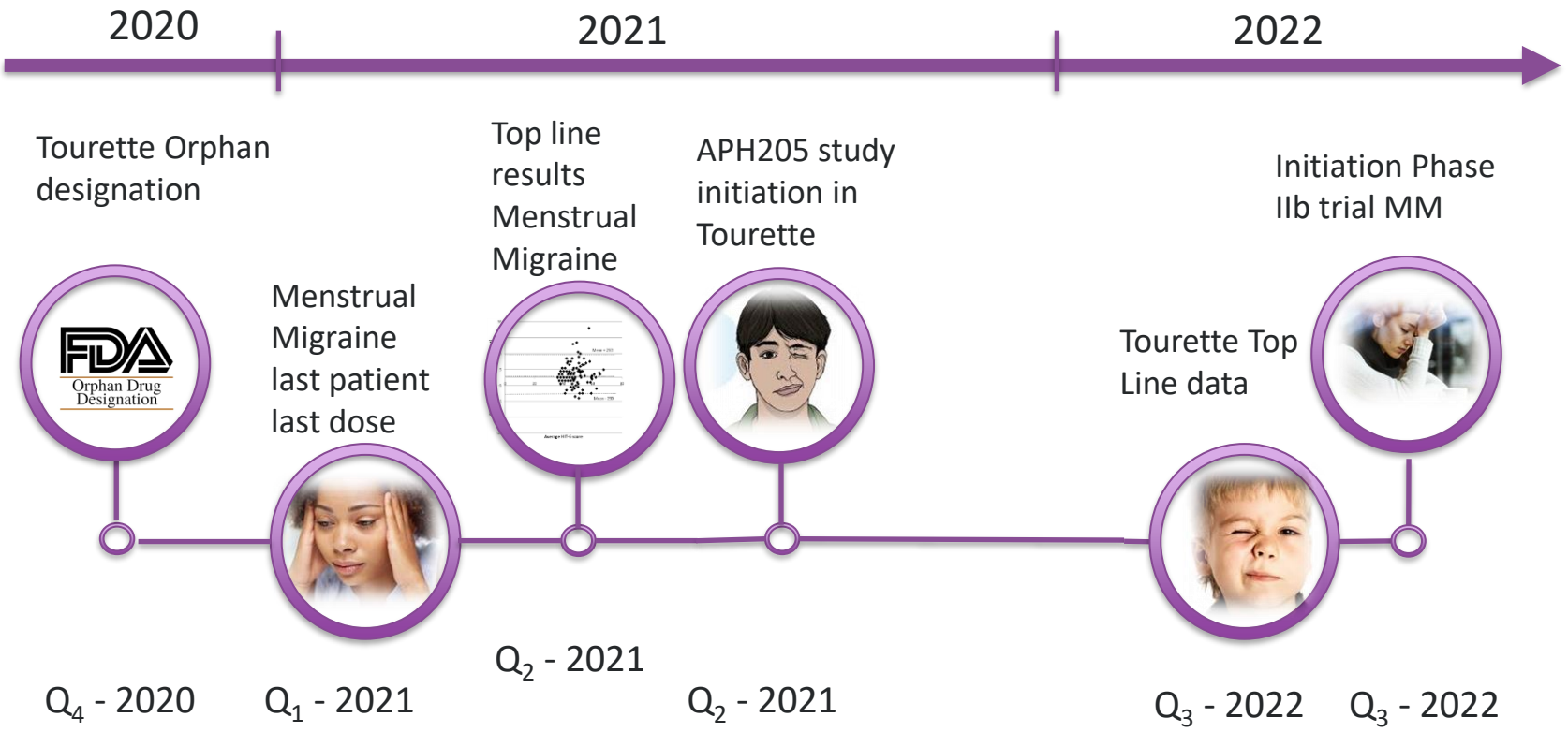
- Sepranolone market introduction 2028
- Sepranolone market penetration of 20 % at peak sales
- 20% or 60.000 patients being treated with Sepranolone

- Annual Sepranolone pricing e.g. USD 30.000
  (Ingrezza for TD: USD 64.400 annually)

- Annual ww peak sales of Sepranolone > USD 1.0 bill

[1]Thelanasis Tourette Market outlook 2018-2030

New Term Value Inflection Points



✓ IND approved for Menstrual Migraine July 2019