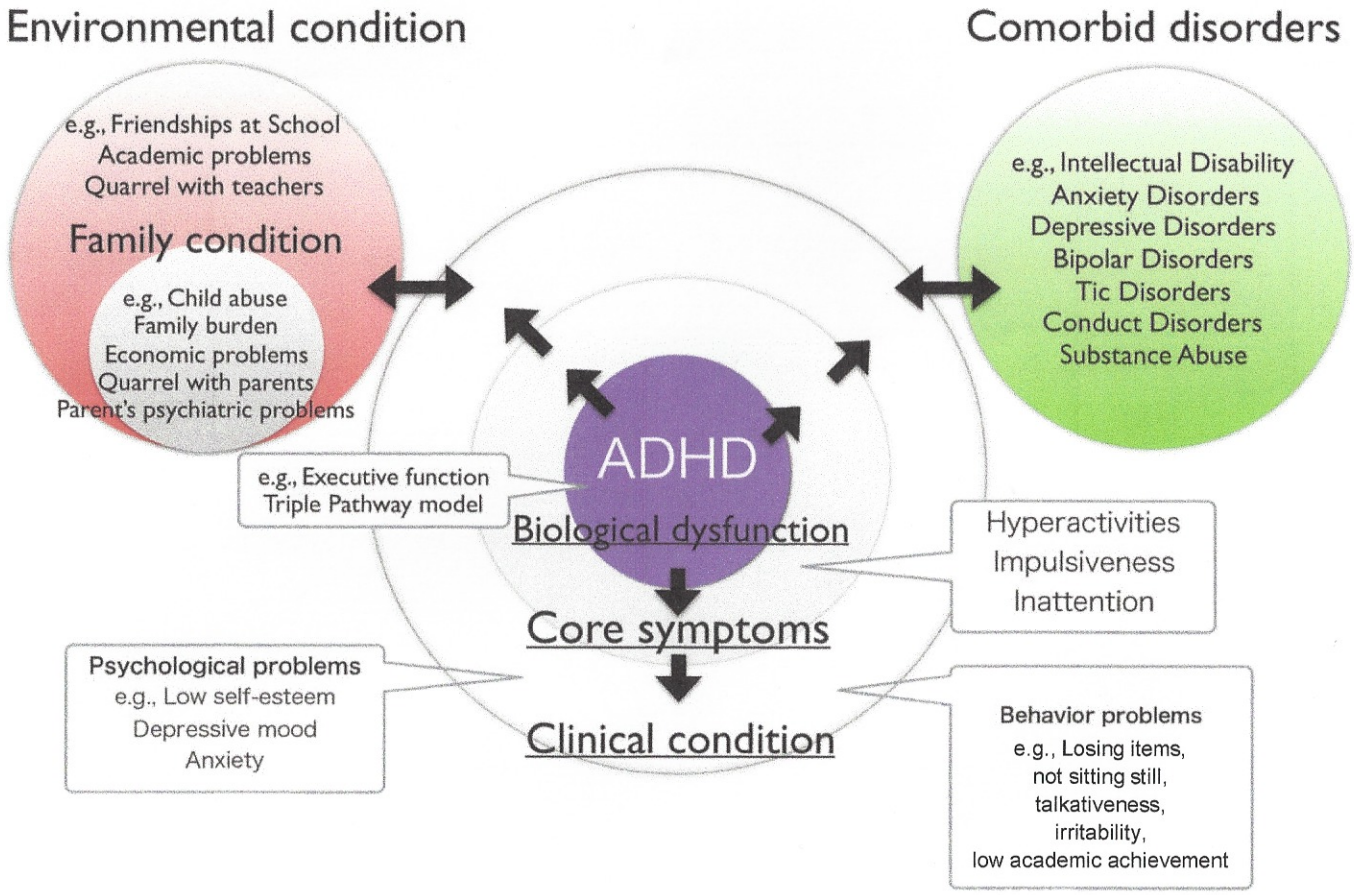
An Overview of ADHD Symptoms



ADHD Diagnostic Criteria

At Least 6 Required, for at Least 6 Months

A1: Inattention

1. Does not give close attention to details or makes careless mistakes
2. Has difficulty sustaining attention on tasks or play activities
3. Does not seem to listen when directly spoken to
4. Does not follow through on instructions and does not finish schoolwork, chores, or duties in the workplace
5. Has trouble organizing tasks or activities
6. Avoids, dislikes, or is reluctant to do tasks that need sustained mental effort
7. Loses things needed for tasks or activities
8. Easily distracted
9. Forgetful in daily activities

A2: Hyperactivity and Impulsivity

1. Fidgets with, or taps, hands or feet, or squirms in seat
2. Leaves seat in situations when staying seated is expected
3. Runs about or climbs when not appropriate (may present as feelings of restlessness in adolescents or adults)
4. Unable to play or undertake leisure activities quietly
5. "On the go", acting as if "driven by a motor"
6. Talks excessively
7. Blurts out answers before a question has been finished
8. Has difficulty waiting his or her turn
9. Interrupts or intrudes on others

B. Several inattentive or hyperactive-impulsive symptoms were present prior to age 12 years

C. Several inattentive or hyperactive-impulsive symptoms are present in two or more settings (e.g., at home, school, or work; with friends or relatives; in other activities)

D. There is clear evidence that the symptoms interfere with, or reduce the quality of, social, academic, or occupational functioning

E. The symptoms do not occur exclusively during the course of schizophrenia or another psychotic disorder and are not better explained by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder, personality disorder, substance intoxication, or withdrawal)

Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: American Psychiatric Association; 2013; Thapar A, Cooper M. Lancet 2016;387:1240-50.

Evolution of the DSM

- Major DSM-5 changes:
  - Contextualized the criteria to be more applicable for adults
  - Reduced the number of required symptoms for adolescents and adults
  - Age at which symptoms must have been present changed from 7 to 12 years
  - "Subtypes" are now termed "current presentation" (as subtypes are not always stable)
  - Allowed, for the first time, dual diagnosis of ADHD and certain comorbid conditions (autism)
- Challenges that remain with DSM-5:
  - Problems with self-report (underreporting is common)
  - Diagnostic heterogeneity (disagreement among HCPs may threaten validity of diagnosis)
  - Lack of definition of impairment (may make diagnosis unreliable)
  - Difficulties with differential diagnosis and comorbidity

What non-core symptoms are common in ADHD?

CONDUCT/OPPOSITIONAL DEFIANCE

MOOD, ANXIETY, OR PERSONALITY DISORDERS

AUSTISM SPECTRUM DISORDER/TRAITS

SUBSTANCE USE DISORDERS AND IMPAIRED EXECUTIVE FUNCTION

LEARNING DISABILITY

EMOTIONAL LABILITY

MOTOR COORDINATION DIFFICULTY

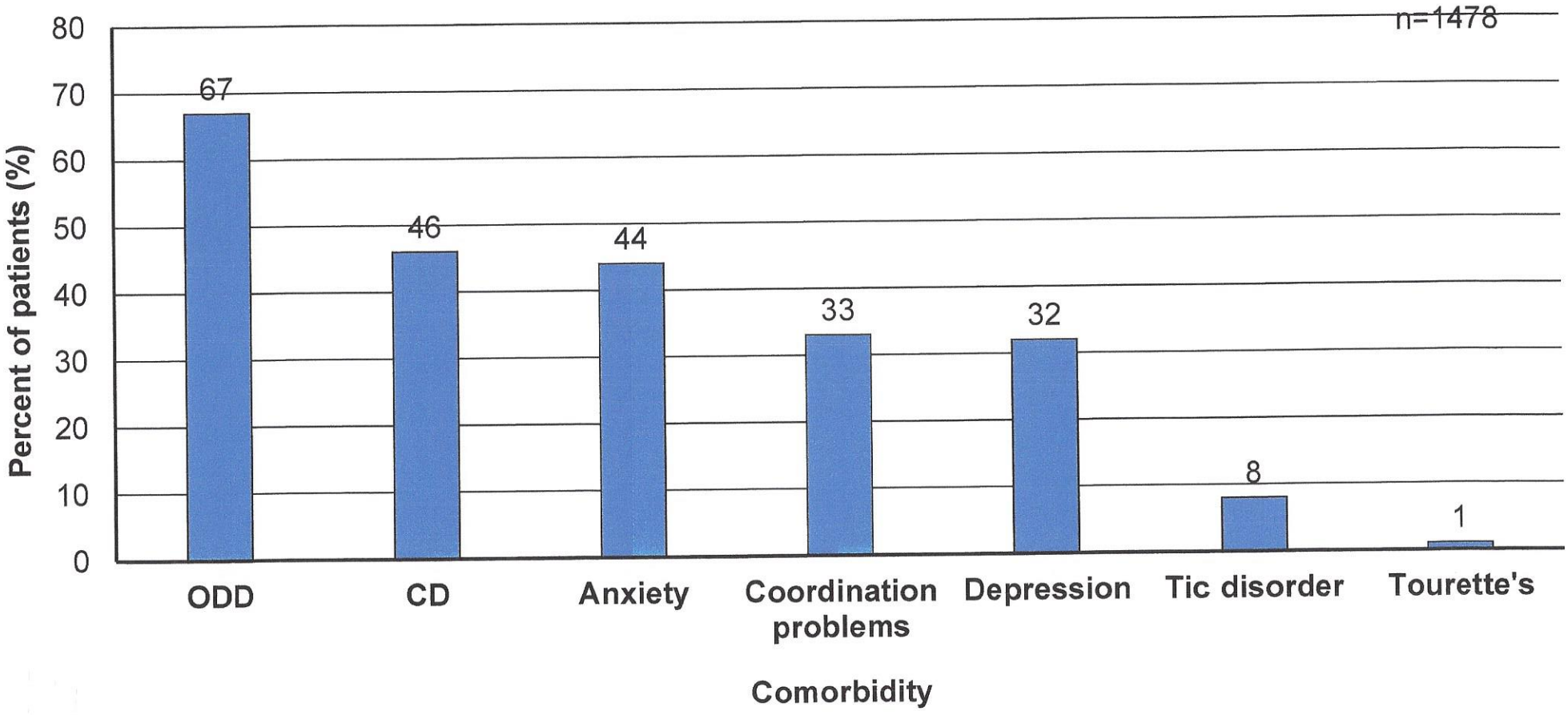
SLEEP DISORDERS

TIC DISORDER

Additionally, the more severe the ADHD, the more severe comorbidities may be

Rommelse NNJ et al. J Abnorm Child Psychol 2009;37:793-804.

Conditions Coexistent With ADHD



Steinhausen HC et al. Eur Child Adolesc Psychiatry 2006;15:I25-9.

ADHD vs Bipolar Disorder

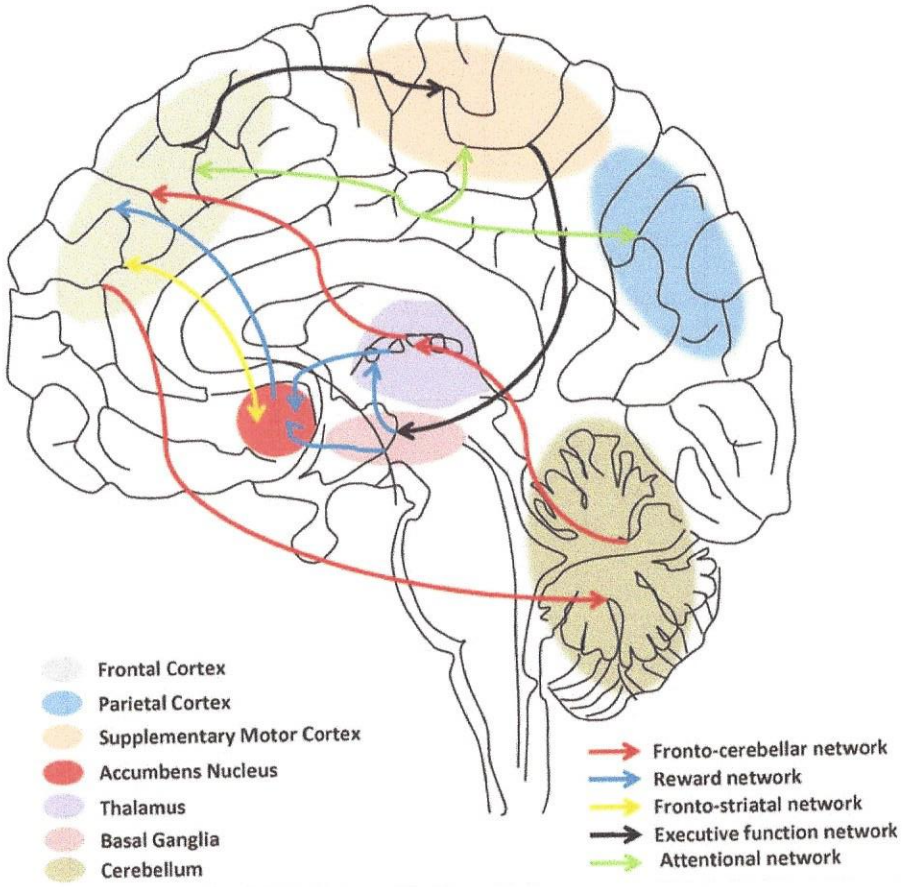
	Bipolar Disorder	ADHD
Premorbid	Good	Problematic
Symptoms	Mood and energy related, inflated self-esteem, increased productivity, psychotic symptoms	Cognitive related. No psychotic symptoms
Course	Episodic	Continuous, stable

Wingo AP, Gheami SN. J Clin Psych. 2007;68:1776-1784; Reichenberg et al., 2002; Brassett-Harknett et al., 2007.

ADHD Diagnosis

- Need accurate diagnosis to target treatment
- Complicated
  - Mimic conditions (medical, developmental, psychiatric)
  - Comorbidities
- There is no one standard test for ADHD
- Comprehensive psychological evaluation can provide wealth of information
- Most conservative approach to ADHD dx

Circuits Involved in the Neurobiology of ADHD



Purper-Ouakil D, Ramoz N, Lepagnol-Bestel AM et al. Pediatr Res 2011;69:69R-76R.

Impairments Associated With ADHD

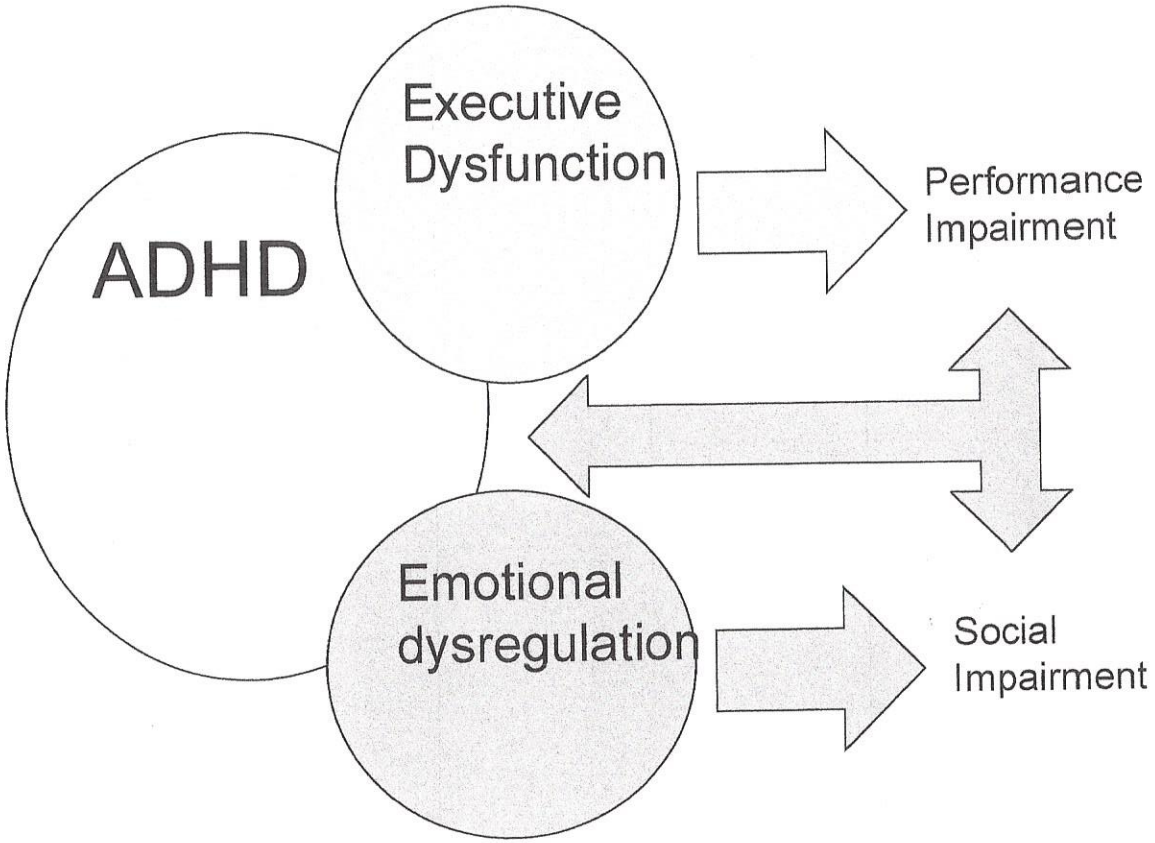
- Developmental delays
  - Mild delays in language, motor, or social development often co-occur with ADHD
- Impaired academic or work performance
  - Difficulty in school, poor transitions to middle school, high school, college, or work
  - Poor occupational functioning (e.g., completing paperwork, meeting deadlines)
- Cognitive deficits
  - Tests of attention, executive function, or memory may reveal cognitive problems
  - Not sufficiently sensitive or specific to serve as diagnostic indices
- Emotional impairments
  - Low frustration tolerance, irritability, or mood lability
  - By early adulthood, ADHD is associated with an increased risk of suicide attempt, primarily when comorbid with mood, conduct, or substance use disorders

Diagnostic and statistical manual of mental disorders. 5th ed. American Psychiatric Association: Washington, DC; 2013; Shaw M, Hodgkins P, Caci H et al. BMC Med 2012;10:99.

Emotional Dysregulation in ADHD

- ED, when associated with ADHD, involves two primary deficits
- An **inhibitory deficit**: socially inappropriate behavioral responses to strong emotion
- A **self-regulatory deficit**: an inability to
  - a) self-soothe physiologic arousal that strong emotion induces
  - b) refocus attention
  - c) organize the self for coordinated action toward an external goal

Impairment Sources



Psychological Evaluation: Components

- Diagnostic Interview
- Rating Scales
  - Parents, teachers, self-report
- Direct Observation
- Psychological Testing
  - Core battery
  - Extended battery
- Written Report (current for 3-5 years)
  - Diagnosis
  - Treatment recommendations

Psychological Evaluation: Issues to Consider

- Time
- Money/insurance coverage
- Prior testing (concerns about practice effects)
- Timing
  - Generally useful, particularly during high school
  - Necessary to obtain accommodations for high-stakes testing
  - Assist in planning for college
    - Student support services, accommodations

Psychological Evaluation: Conclusions

- Important for diagnostic clarification
- Important for treatment planning
- Important for understanding strengths and weaknesses (helps with choosing classes/ careers)
- Important for getting services at school
- Important for getting testing accommodations
- Important for increasing likelihood of success

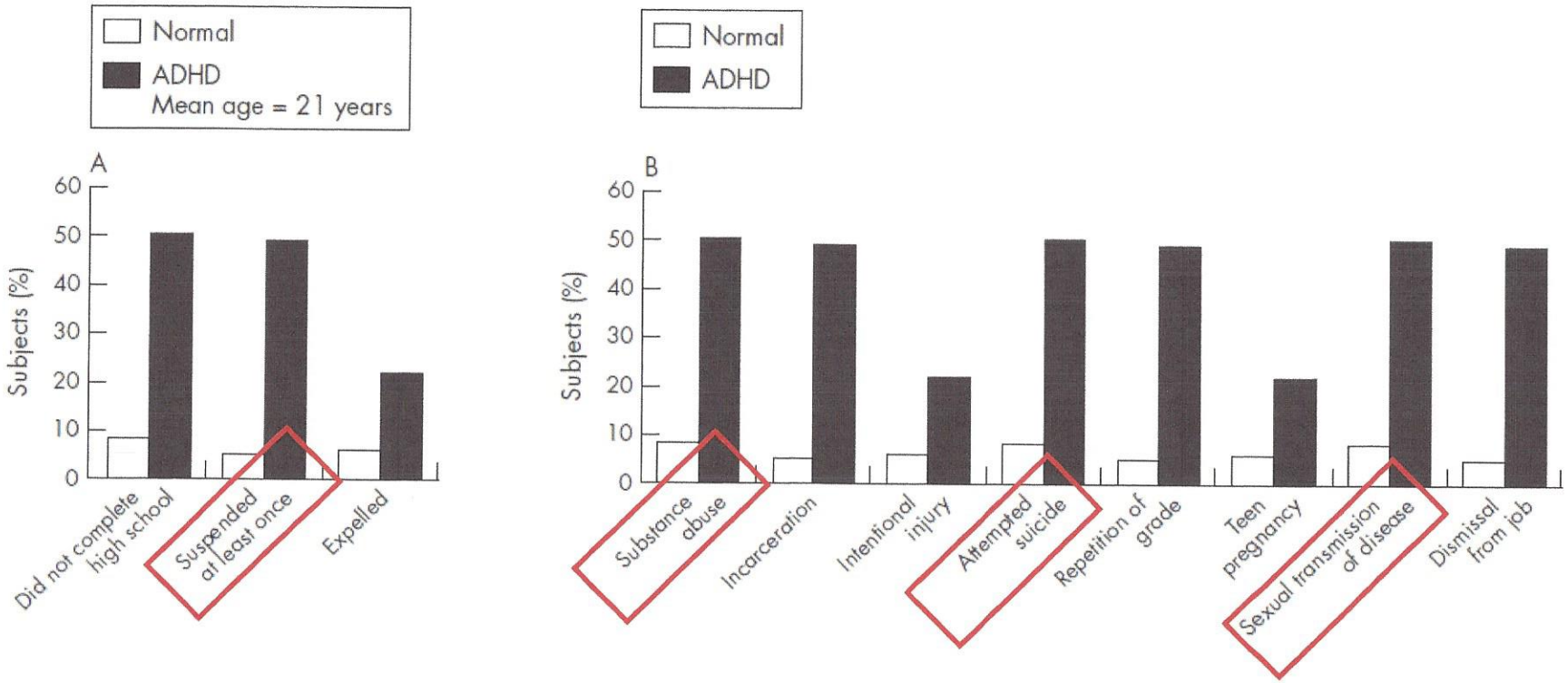
Comorbidities and Associated Features

Age-Related Changes in the Clinical Picture of ADHD and Comorbidities

- ~65% of patients continue to meet full criteria or have achieved only partial remission by adulthood
- When ADHD continues into adulthood, the manifestations of comorbid symptoms change
  - Impulsivity and hyperactivity do not usually persist
  - Inattention typically persists into adulthood and may continue into the geriatric years
  - Adult ADHD tends to be associated with depression, anxiety, and substance dependency

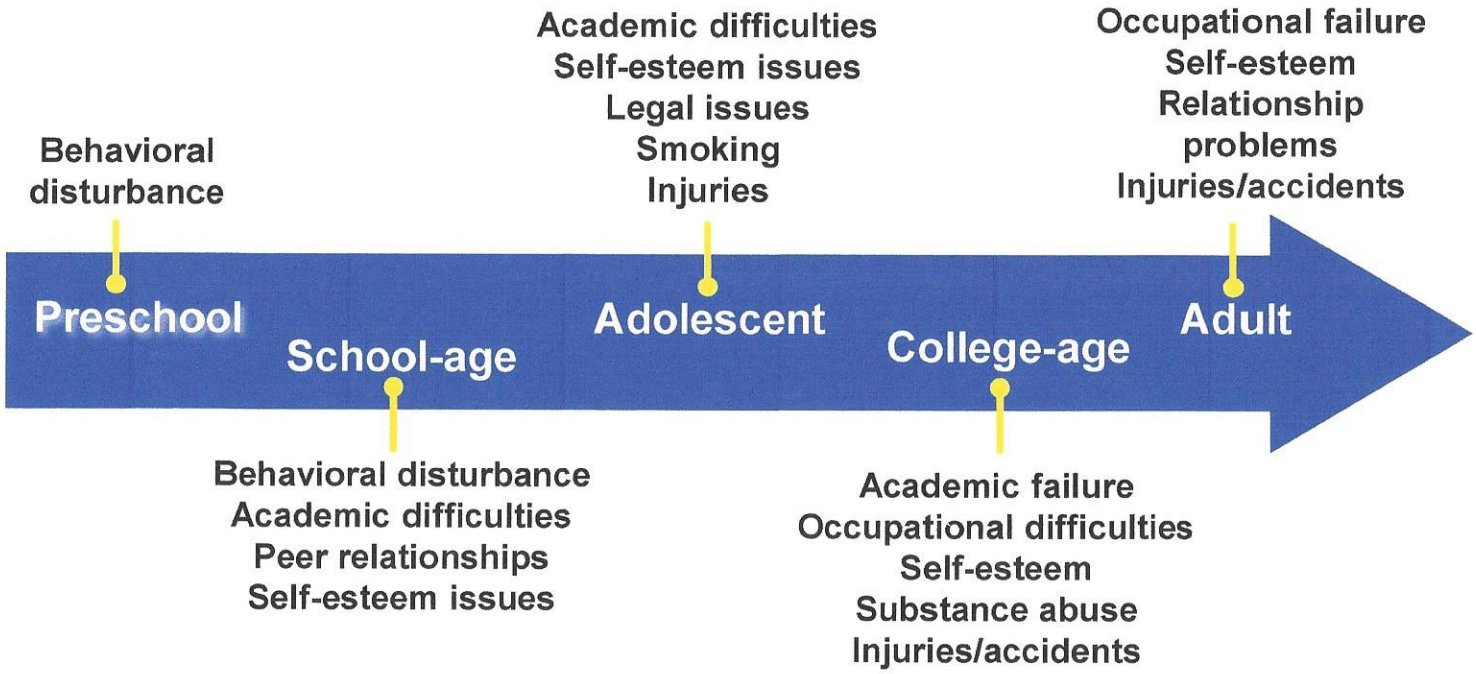
Thapar A, Cooper M. Lancet 2016; 387: 1240–50; Ivanchak N. et al. Curr Psychiatry Rep. 2012; 14(5): 552–560.

Impact of ADHD on School Attendance and Health, Social, and Psychiatric Wellbeing



Harpin VA. Arch Dis Child 2005;90(Suppl I):i2–i7.

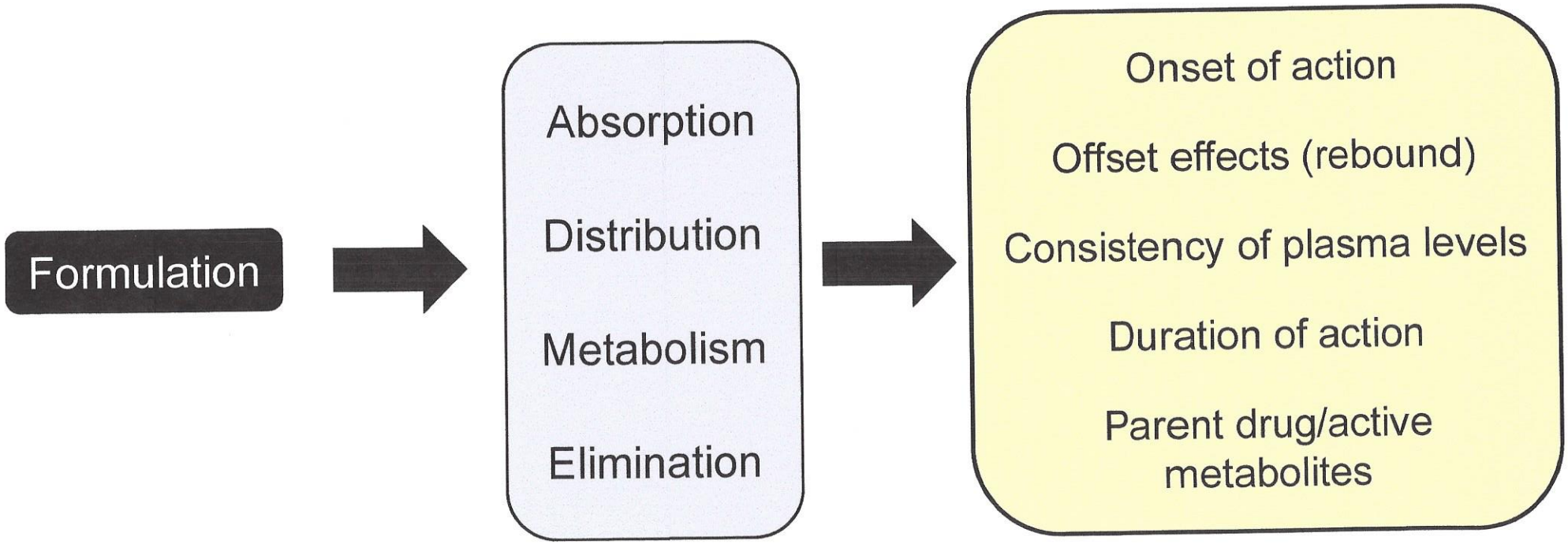
Developmental Impact and Targets of Treatment for ADHD



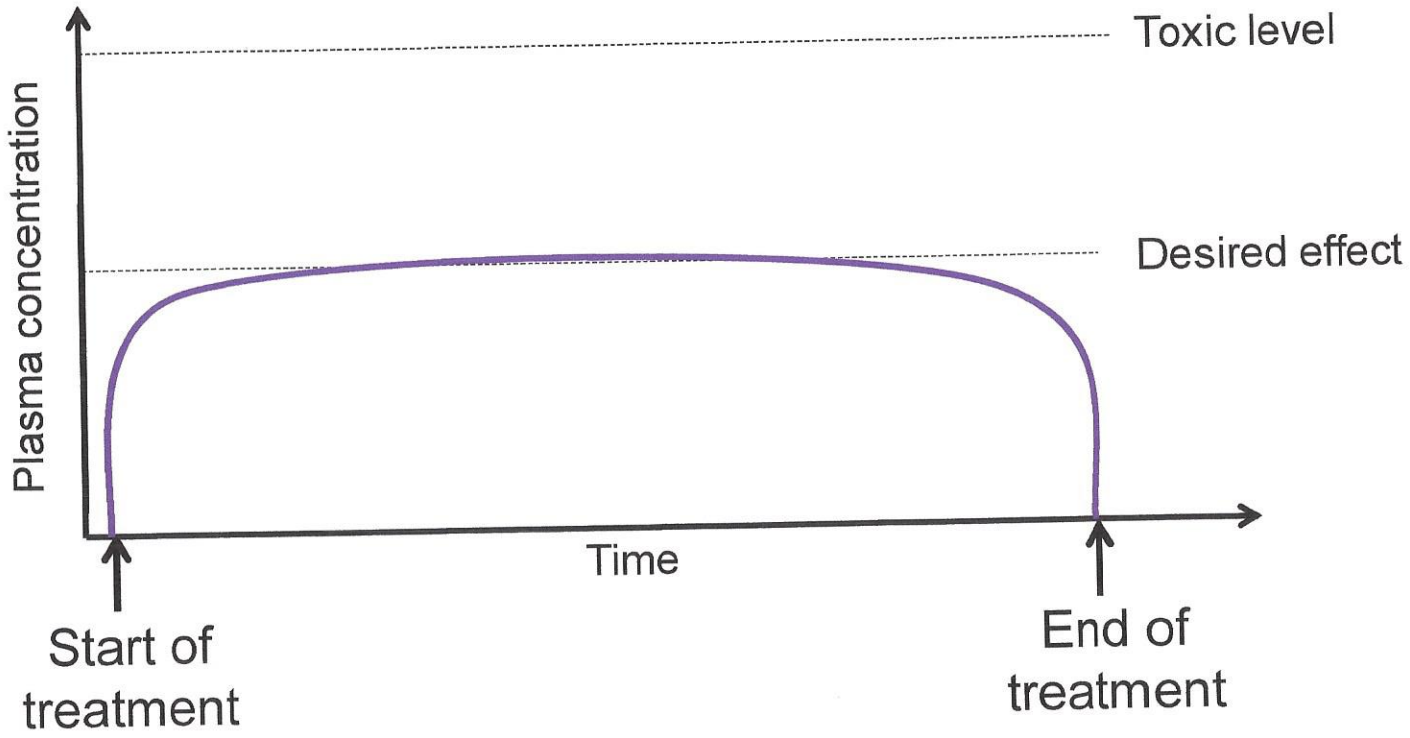
Pliszka S AACAP Work Group on Quality Issues. *J Am Acad Child Adolesc Psychiatry*. 2007;46(7):894-921; Brown TE et al. *Postgrad Med*. 2010;122(5):42-51.

Choosing the Right Medication
Monotherapy and Combination Treatment

How Formulation Influences Medication Effects: Pharmacokinetics



Ideal Drug Delivery



Stahl SM, Wets KM. Clin Neuropharmacol 1988;11:1-17.

Customization Meeting Needs

- Need for coverage changes by age and demands
- School day in kindergarten and early elementary school need a 4-8 hour coverage
- Middle school sports, religious education, clubs, much more homework need 8-12 or beyond
- High school early wake-up, driving, clubs, jobs, sex, sports need 12 or more hours of coverage
- On top of those time lines, one must balance side effects, growth issues, concomitant medications and sleep issues
- Some comorbid illnesses may also dictate choice of medication

The Approach

- Start with monotherapy and select the duration you need
- If you have morning or afternoon/evening issues, may add the IR form on to a long-acting base medication
- If one is still not able to meet the day's requirements, add another medication category, such as an FDA approved combination of alpha agonist plus stimulant
- No benefit at all, switch to the other medication in same category (i.e., methylphenidate to amphetamine)
- May need to add off-label combinations or medications not FDA approved
  - Atomoxetine plus stimulant or alpha agonist
  - Any FDA-approved medication plus antipsychotic
  - Bupropion for depression + ADHD

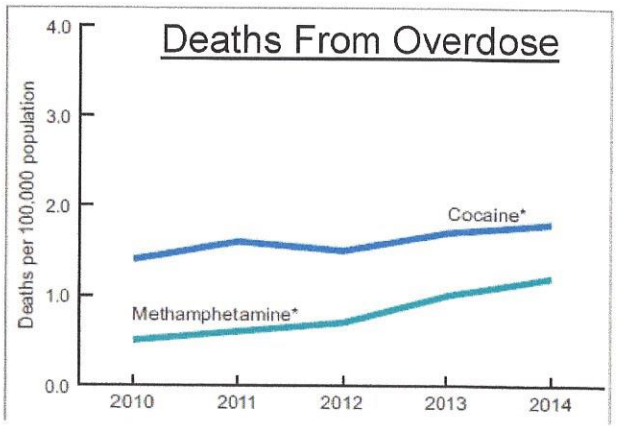
Contraindications and Side Effects May Limit the Use of Stimulant Medications for ADHD

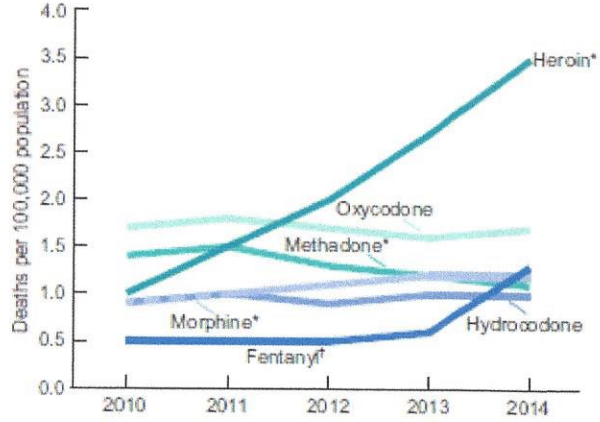
- Mania and psychosis are contraindications for stimulants
- Depression, tics, and anxiety can worsen with stimulants
- Substance use disorders might lead to abuse or diversion
- Common side effects of stimulants (e.g., insomnia, appetite suppression) may limit 24-hour use
- Some rare but serious adverse effects (e.g., onset of tics, acute anxiety states, depression, psychosis, or mania) require prompt discontinuation of stimulant

Faraone SV et al. Nat Rev Dis Primers 2015;1:15020; Barkley RA. Attention-deficit hyperactivity disorder, 4th Ed.: a handbook for diagnosis and treatment. Guilford Publications; 2014.

Stimulant Abuse: a Growing Epidemic

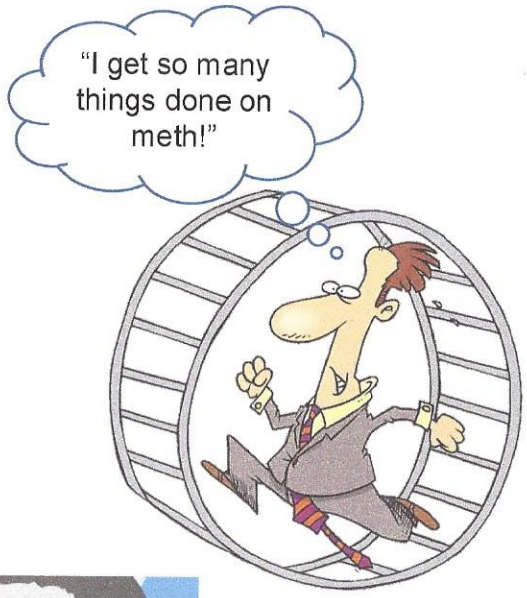
- Stimulants are the 2nd most widely abused drugs after cannabis
  - ~53.8 million methamphetamine/amphetamine users worldwide
    - 0.9 million in the USA have a meth/amph use disorder
  - ~20 million cocaine users worldwide
    - 0.9 million in the USA have a cocaine use disorder
- Increased risk for stimulant abuse associated with:
  - Being male
  - One or both biological parents with a substance use disorder (SUD)
  - Antisocial personality disorder
  - Living with someone who has an SUD
  - Unemployment



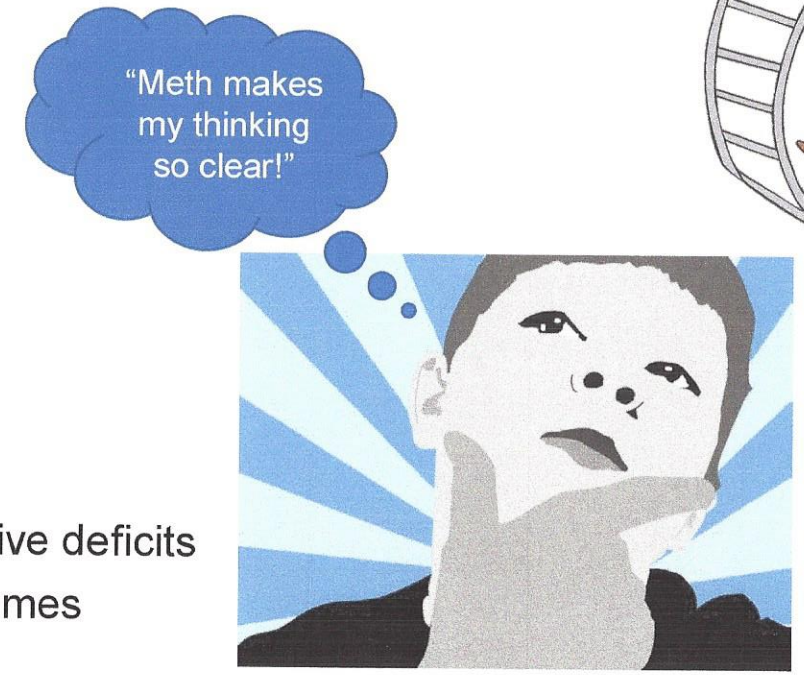


Ashok et al. JAMA Psychiatry 2017;74(5):511-9; Ballester et al. Exp Rev Clin Pharmacol 2017;10(3):305-14; Brackins et al. J Pharm Pract 2011;24(6):541-50; Butelman, Kreek. Exp Opin Emerg Drugs 2017;22(4):301-15; Lauritzen, Nordfjaern. PLOS One 2018;13(1):e0190381; Morais et al. CNS Neurosci Ther 2018;24:85-97; Warner et al. Nat Vit Stat Rep 2016;65(10).

Cognitive Deficits



- "Subjective" impression of increased mental capacity and productivity
- But actually…there are deficits in:
  - Learning
  - Memory
  - Speed of information processing
  - Verbal reasoning
  - Problem solving
  - Planning
  - Focusing
  - Multi-tasking
  - Cognitive flexibility
  - Dealing with novelty
- The longer the use, the worse the cognitive deficits
- These deficits can affect treatment outcomes



Ballester et al. Exp Rev Clin Pharmacol 2017;10(3):305-14; Proebst et al. Pharmacopsychiatry 2018; Epub ahead of print; Farhadian et al. Neurosci 2017;8(2):147-54; Zhong et al. Prog Neuros-Psychopharm Biol Psychiatry 2016;69:31-7.

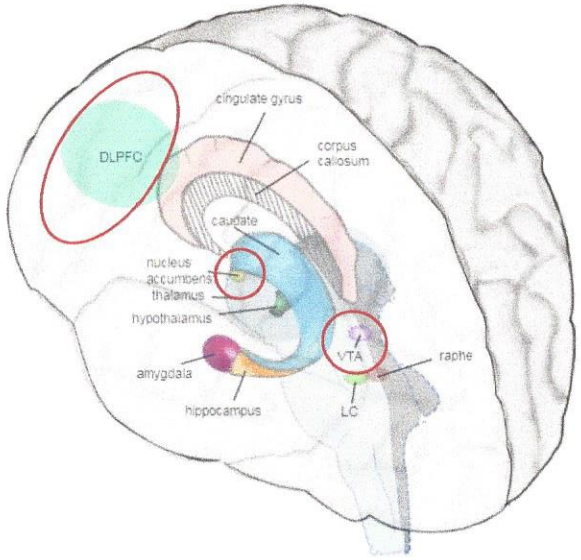
The Rewards of Dopamine

- Stimulants also increase levels of:
  - Norepinephrine (NE): Arousal, cardiovascular actions, and stress-induced relapse
  - Serotonin (5HT): Behavioral effects and development of addiction
  - Glutamate (Glu): Drug- and cue-induced reinstatement and drug-seeking
  - Acetylcholine (ACh): Perceived cognitive enhancement (including sustained attention)
- Interestingly, the perceived effects of meth are dependent on striatal dopamine D2 receptor levels
  - Low levels = meth is pleasant
  - High levels = meth is unpleasant

Ashok et al. JAMA Psychiatry 2017;74(5):511-9; Ballester et al. Exp Rev Clin Pharmacol 2017;10(3):305-14; Levy F. Ther Adv Psychopharmacol 2016;6(6):382-3; Volkow, Swanson. Am J Psychiatry 2003;160:1909-18.

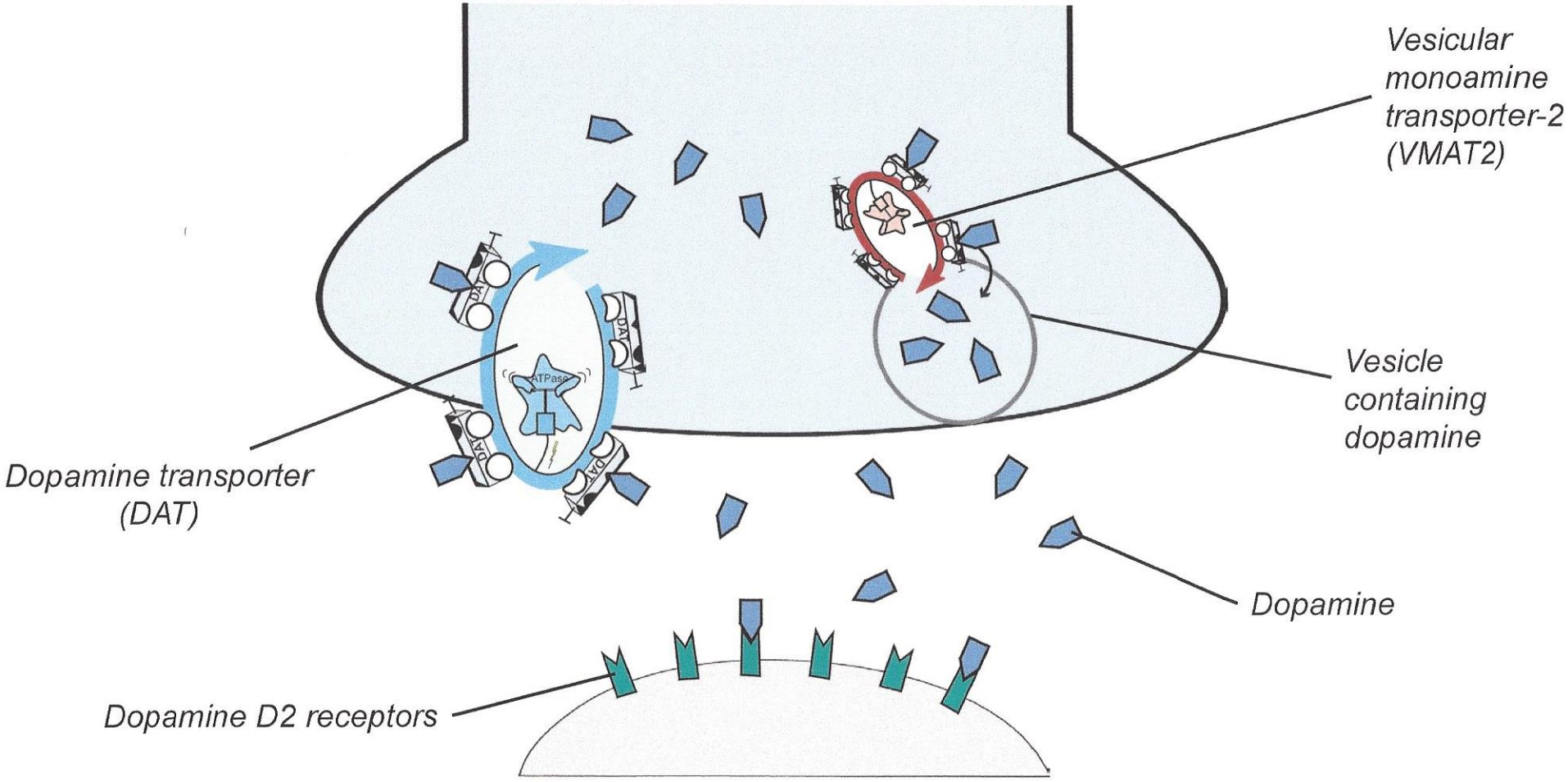
The Rewards of Dopamine

- Subjective rewards are due to stimulants increasing synaptic dopamine (DA) levels in the mesocorticolimbic system
  - Mesocortical circuit includes ventral tegmental area (VTA) projections to nucleus accumbens and prefrontal cortex



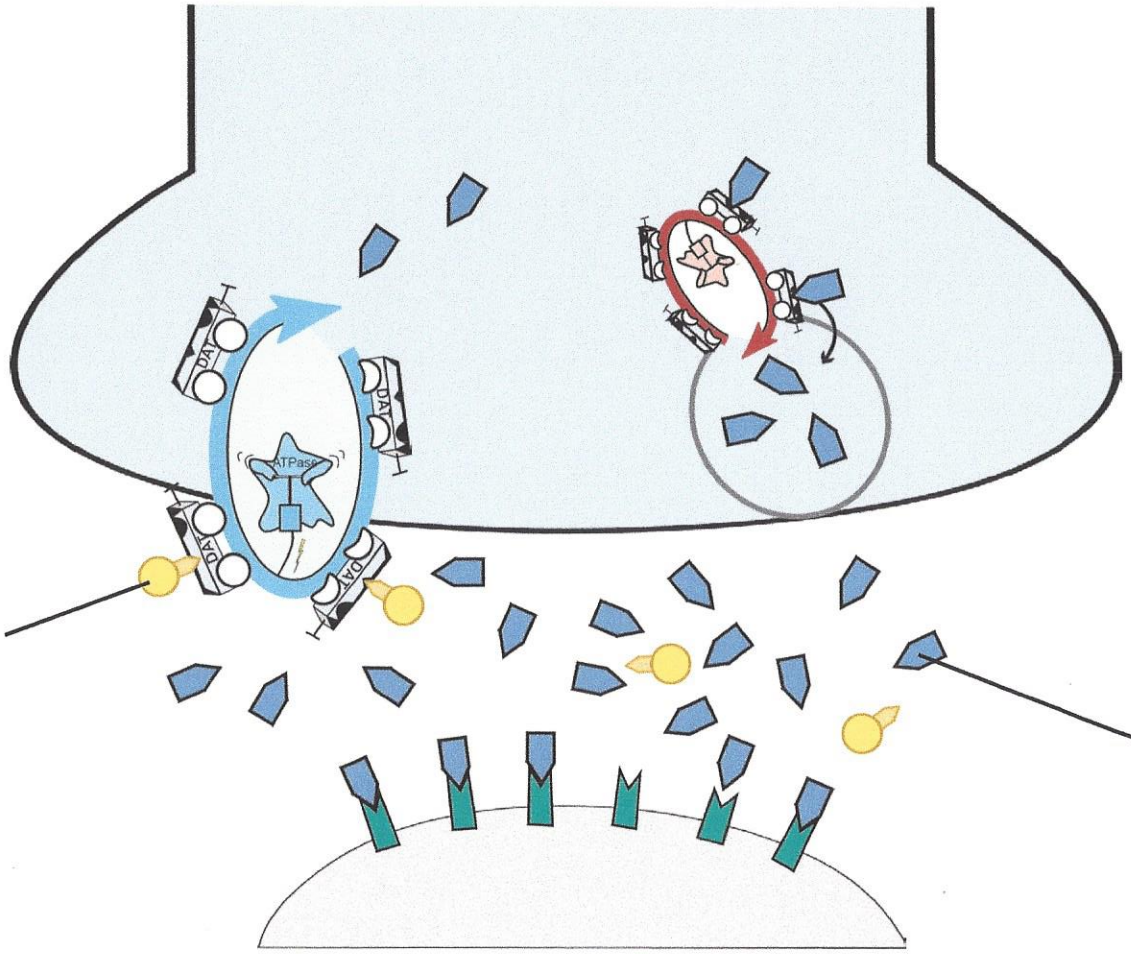
Ashok et al. JAMA Psychiatry 2017;74(5):511-9; Ballester et al. Exp Rev Clin Pharmacol 2017;10(3):305-14; Levy F. Ther Adv Psychopharmacol 2016;6(6):382-3; Volkow, Swanson. Am J Psychiatry 2003;160:1909-18.

Dopaminergic Synapses



Stahl SM. Stahl's Essential Psychopharmacology 2015.

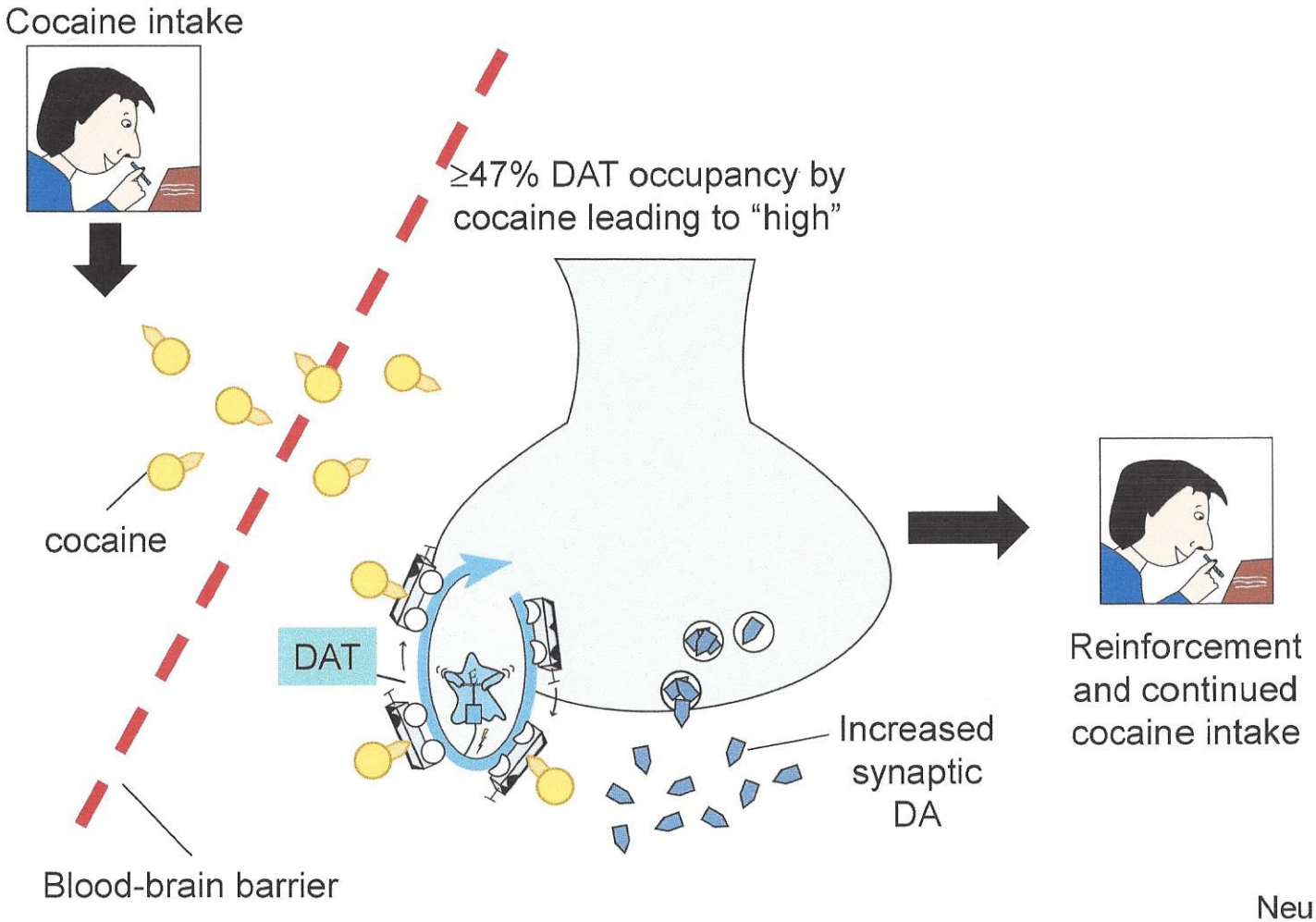
Dopaminergic Effects of Cocaine



Cocaine blocks DAT, leading to decreased uptake of dopamine from synapse

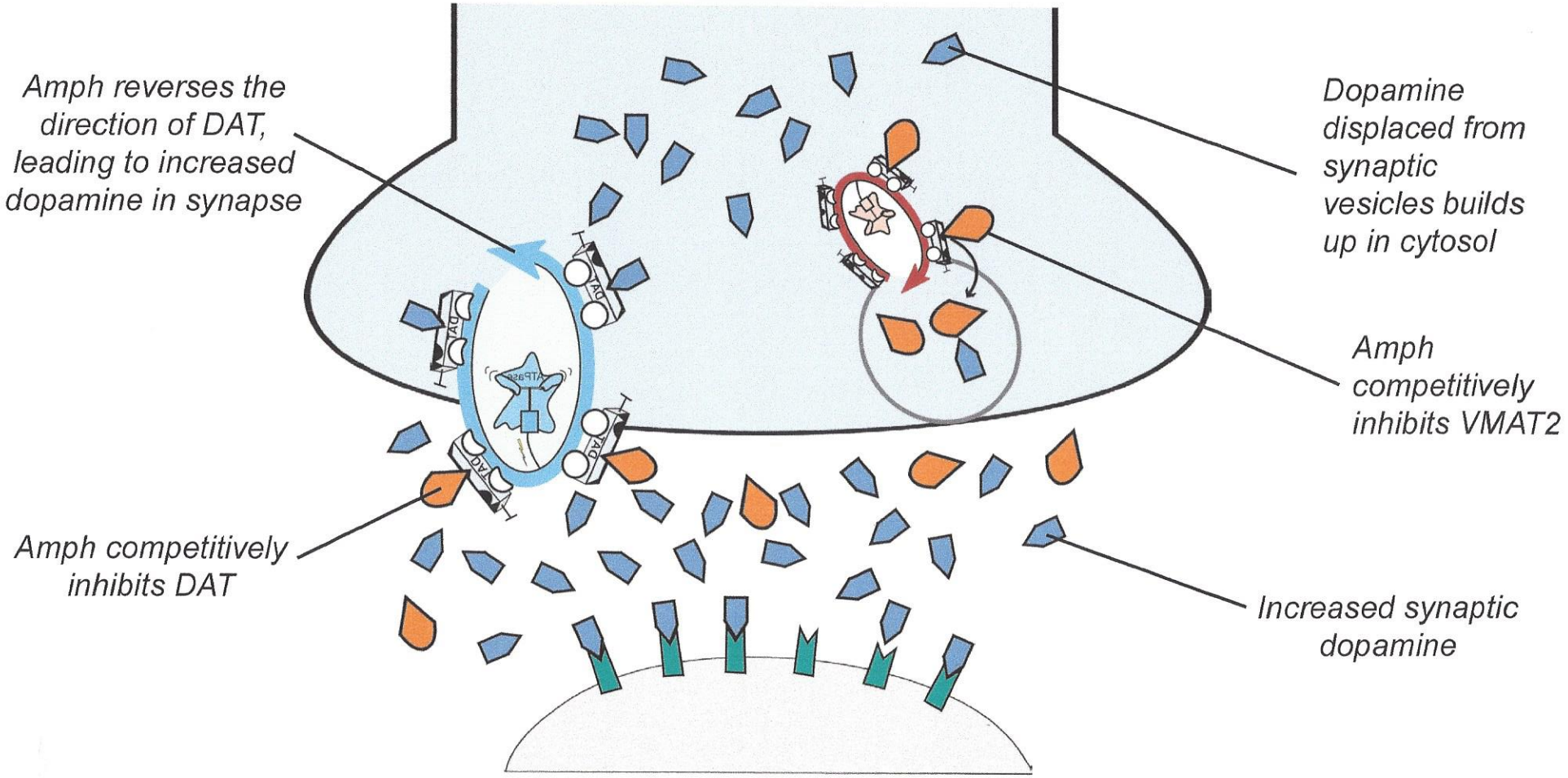
Increased synaptic dopamine

Stahl SM. Stahl's Essential Psychopharmacology 2015; Ashok et al. JAMA Psychiatry 2017;74(5):511-9.



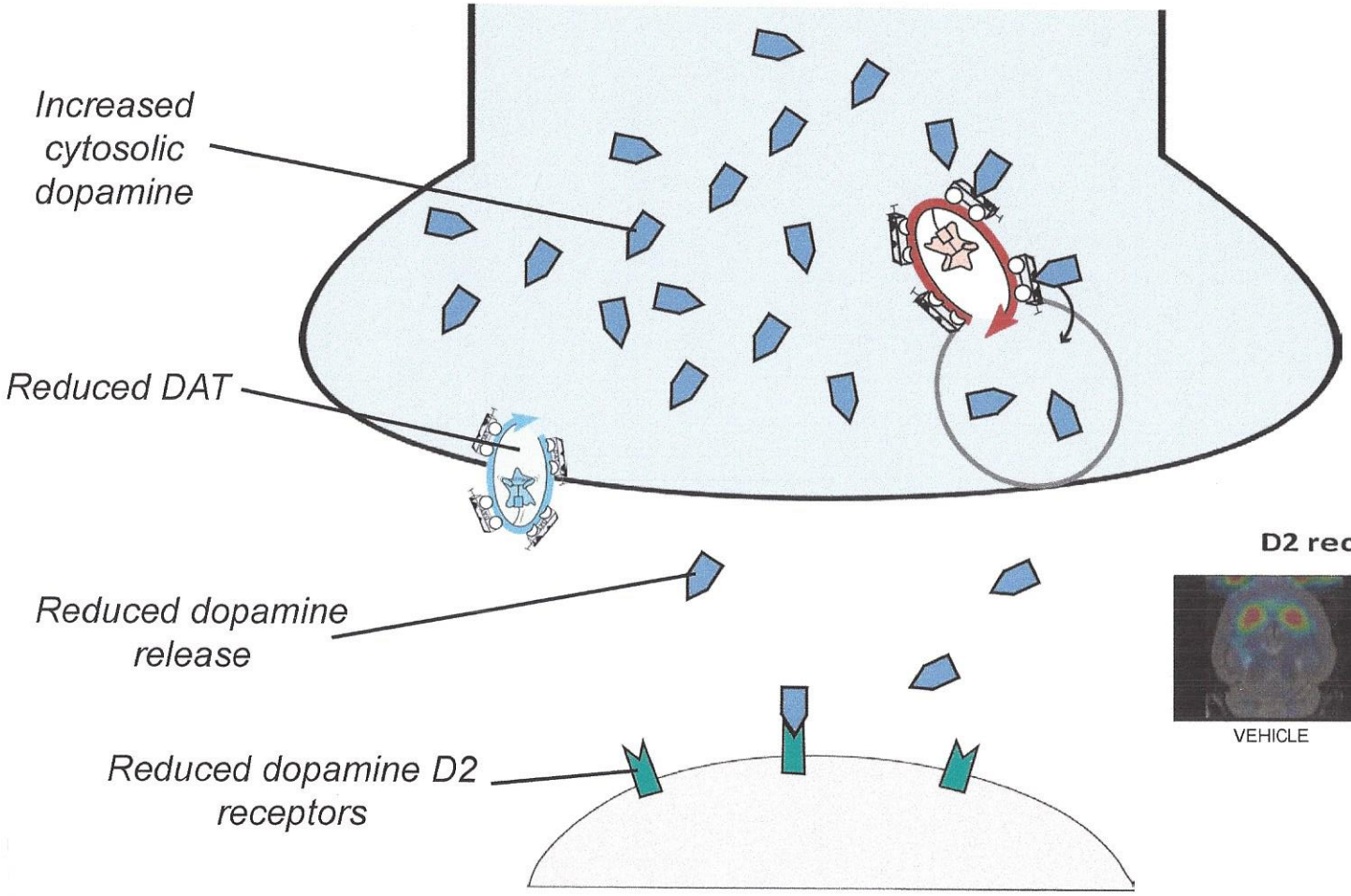
Maoz et al.,
Neuropsychopharmacol
2013;38:2170-8.

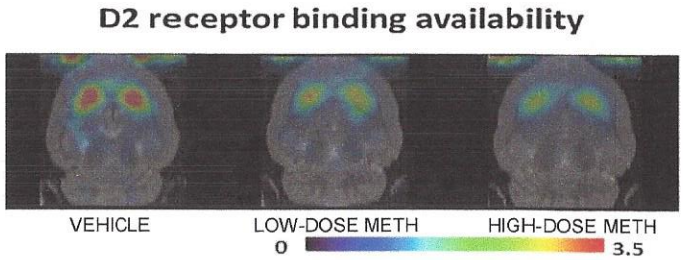
Dopaminergic Effects of Amphetamine



Stahl SM. Stahl's Essential Psychopharmacology 2015; Ashok et al. JAMA Psychiatry 2017;74(5):511-9; Heal et al. J Psychopharm 2013;27(6):479-96.

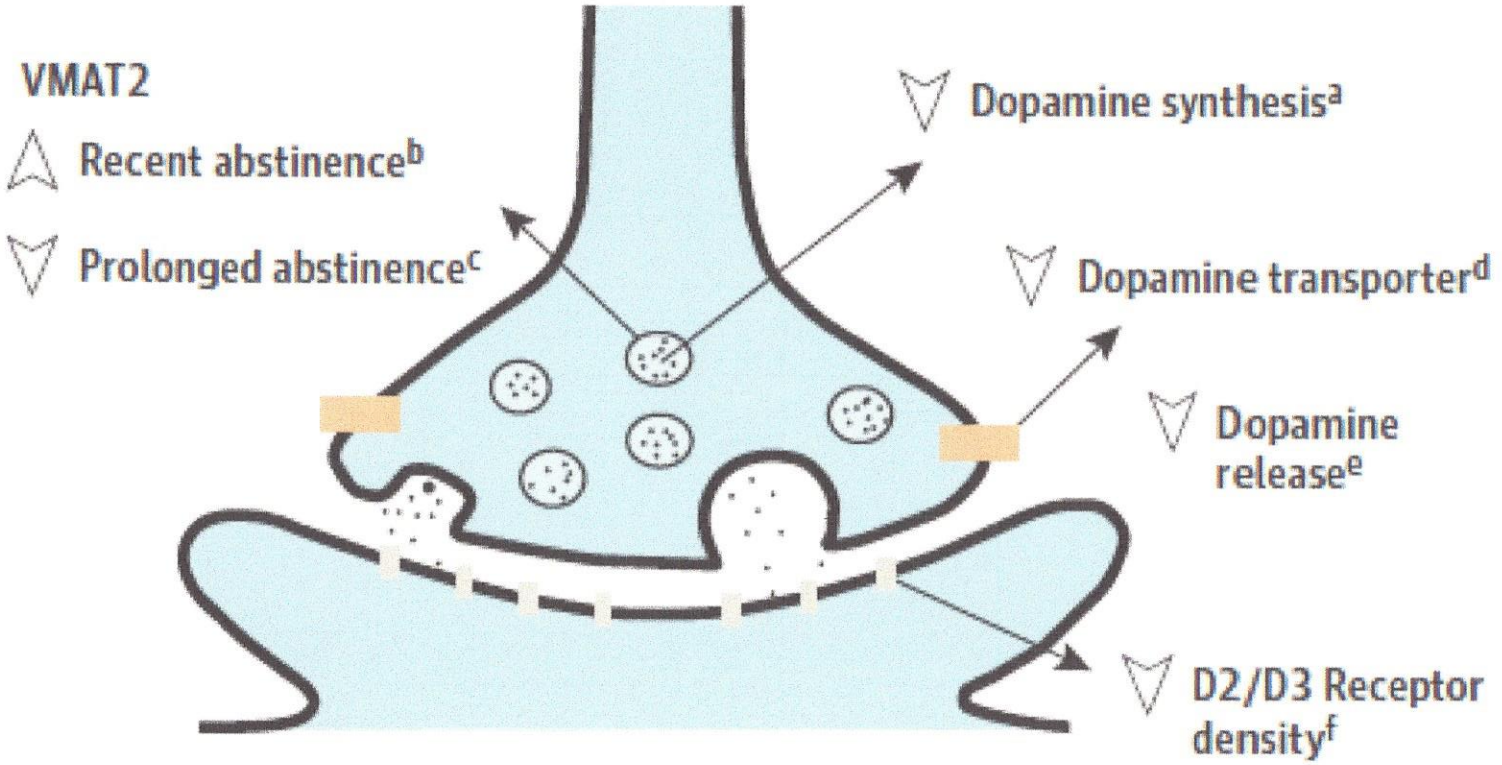
Effects of Chronic Stimulant Abuse on Dopamine



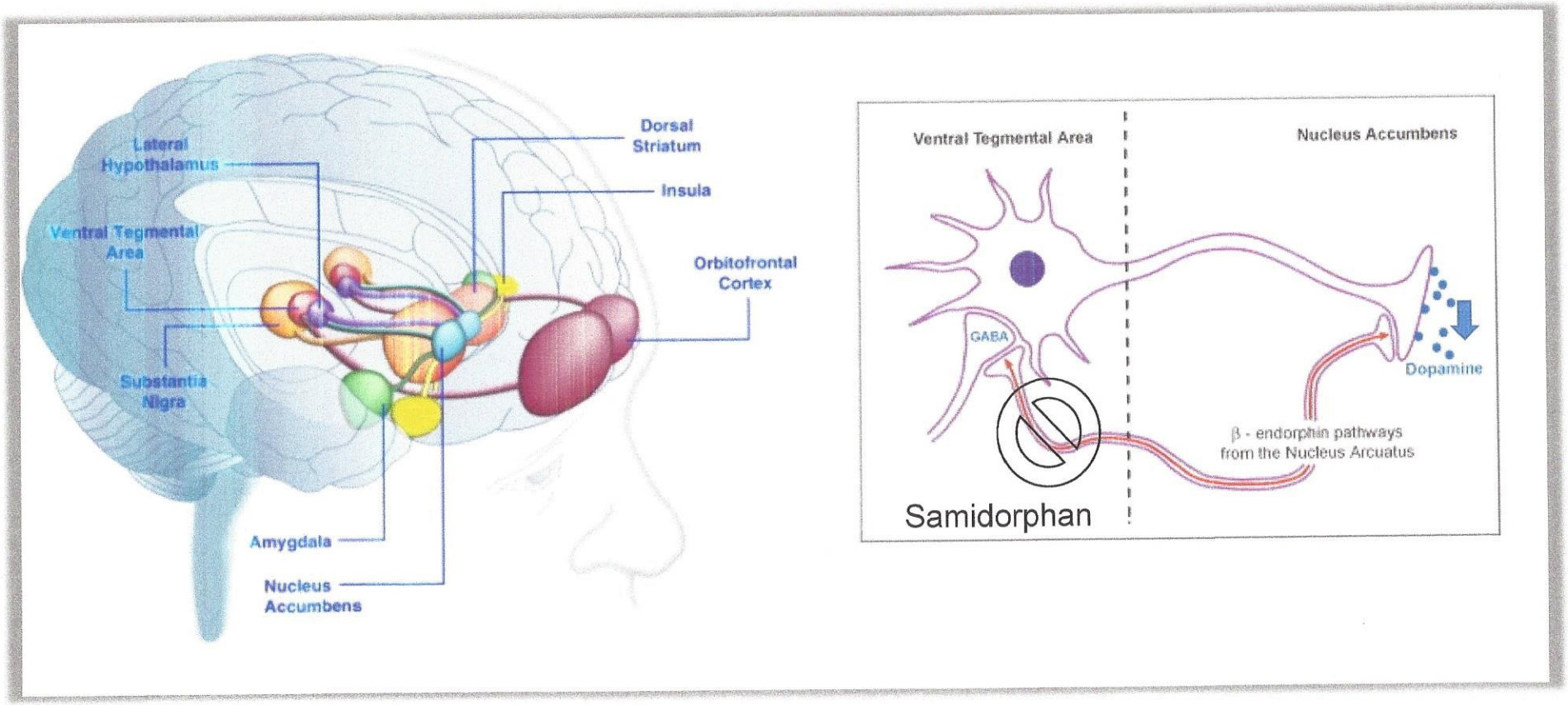


Ashok et al. JAMA Psychiatry 2017;74(5):511-9; Thanos et al. Beh Brain Res 2017;320:282-90.

Summary of Dopaminergic Alterations in Stimulant Users



Proposed Mechanism: Brain Reward Pathway



Kenny et al. Neuron 2011; 69(4): 664-679.

Approved Amphetamine Preparations

Preparation	Duration of action	
Dextroamphetamine	2-3 hrs	liquid
Dextroamphetamine	2-3 hrs	tablet
Dextroamphetamine	4 hrs	tablet
spanules	6 hrs	beaded
Amphetamine (racemic d,l)	6 hrs	tablet
Mixed AMPH salts IR	6 hrs	tablet
XR (double beaded)	Up to 12 hrs	
XR (triple beaded)	14 to 16 hrs	
Amphetamine XR-ODT	12 hrs	Dissolvable tab
Amphetamine ER	12 hrs	liquid
Amphetamine XR	13 hrs	liquid
Lisdexamfetamine	Up to 14 hours	prodrug

Approved Methylphenidate Preparations Summary

Formulation	Duration of action
Generic methylphenidate	2-3 hrs tablet
Methylin liquid	2-3 hrs liquid
MPH SR LA	4 hrs wax matrix 8 hrs beaded
OROS MPH	12 hrs OROS
MPH ER	6-8 hrs beaded
MPH CD	8 hrs beaded
D-MPH IR XR	3 hrs tablet 10 hrs beaded
MPH XR liquid	12 hrs liquid
MPH ER chewable	8 chewable tab
MPH-XR ODT	10 dissolvable tab
MPH DR/ER	10 tablet
MPH transdermal patch	12 hrs patch

Amphetamine (AMPH) in ADHD: Optimizing Dosing

Medication	Starting Dose	Maximum Dose* Usual Dosing	Duration
Adderall®	2.5–5 mg QD	1.5 mg/kg/day	6 hr / BID
Adderall XR®	2.5–5 mg QD		12 hr / QD
Vyvanse®	30 mg QD		12–14 hr / QD
Mydayis®	12.5 mg QD	50/25 mg (adults/adol)	To 16 hr/QD
Dexedrine Tablets®	2.5–5 mg BID	1.5 mg/kg/day	3–5 hr / BID–QID
Evekeo®	2.5–5 mg BID		3–5 hr / BID–QID
Dexedrine Spansule®	5 mg QD		6 hr / QD–BID
Dyanavel XR™ (suspension)	2.5–5 mg QD	1.5 mg/kg/day	12 hr / QD
Adzenys XR™ (disintegrating tab)	6.3–12.5 mg QD	12.5 mg (adolescents)	12 hr / QD

Wilens TE et al. CNS News 2007. Wilens TE et al. Postgrad Med 2010;122(5):97-109. www.drugs.com.

Methylphenidate (MPH) in ADHD: Optimizing Dosing

Medication	Starting Dose	Maximum Dose* Usual Dosing	Duration
Ritalin IR®	5 mg QD/BID	2 mg/kg/day	4 hr /BID
Focalin®	2.5 mg QD/BID	1 mg/kg/day	4–5 hr / BID–TID
Focalin XR®	5 mg QD	1 mg/kg/day	10–12 hr QD
Daytrana®	10 mg		6–16 hr
Concerta®	18 mg QD	2 mg/kg/day	12 hr / once
Metadate CD®	20 mg QD		8 hr / once
Ritalin LA®	20 mg QD		8 hr / once
Quillivant®	<10 mg QD		12 hr / once
Quillichew™	<10 mg QD		8 hr / once
Contempla XR (disintegrating tab)	8.6 mg QD	51.8 mg	12 hr / once

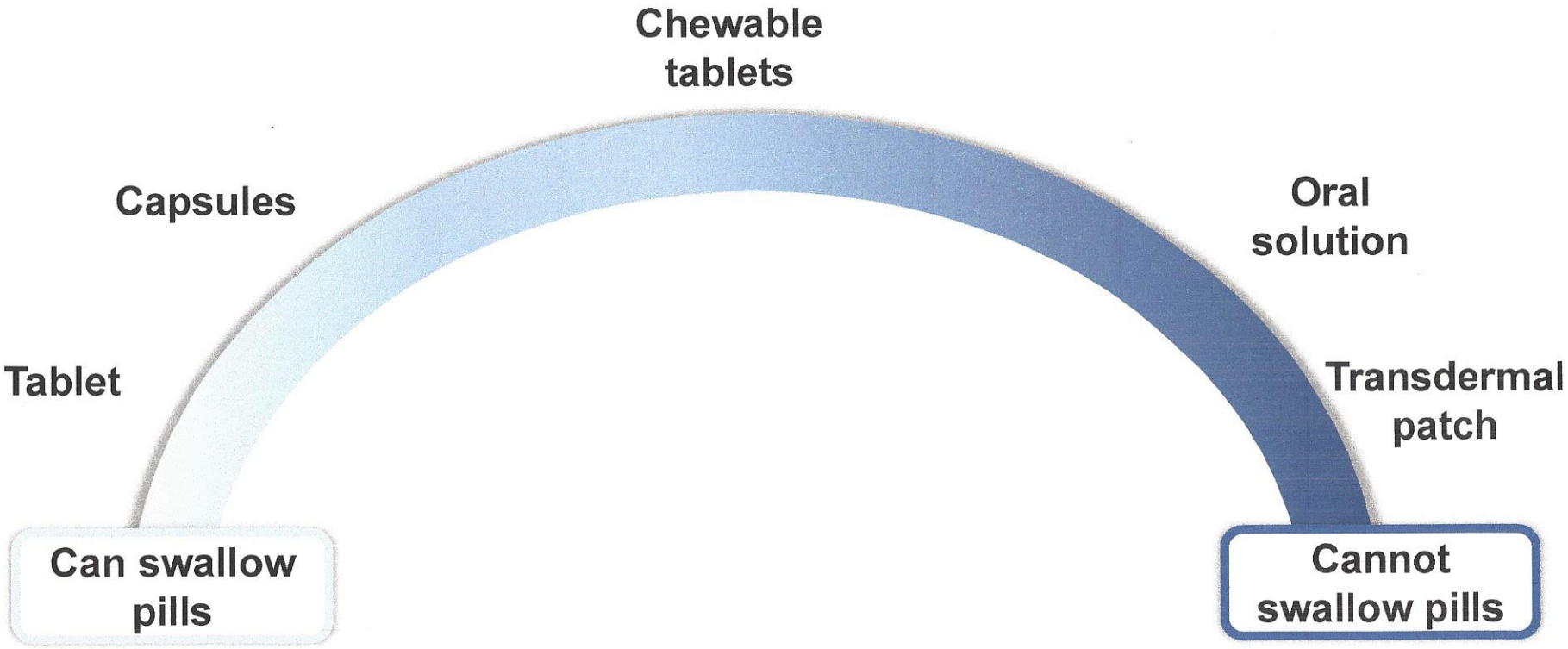
*May exceed FDA approved dose.

Wilens TE et al. Postgrad Med 2010;122(5):97-109. www.drugs.com.

Side Effects and Consequences May Include...

- Psychosis
- Anhedonia
- Irritable/aggressive mood
- Depression
- Anxiety
- Sleep disturbance
- Fatigue
- Diminished cognitive functions
- Musculoskeletal pain
- Hypertension
- Increased respiration rate
- Narrowing of blood vessels
- Stroke
- Cardiomyopathy
- Dental and periodontal disease
- Homelessness
- Unemployment
- Crime
- Imprisonment
- Increased risk of HIV and hepatitis
- Increased risk of developing Parkinson's disease later in life

Ballester et al. Exp Rev Clin Pharmacol 2017;10(3):305-14; Javadian et al. Prim Care Companion CNS Disord 2016;18(6):10.4088/PCC.16m02002; Morais et al. CNS Neurosci Ther 2018;24:85-97; Volkow, Swanson. Am J Psychiatry 2003;160:1909-18; Warner et al. Nat Vit Stat Rep 2016;65(10).



Cutler AJ, Mattingly GW. CNS Spectr. 2017;22(6):463-474.

Reasons to Consider Formulations

- Liquid agents can be precisely adjusted
- Sublingual administration avoids first-pass metabolism, resulting in quicker absorption and onset of effect as compared to other oral delivery methods
- ODTs may enhance compliance, not only in individuals with swallowing or tactile issues, but also in pill-averse patients who refuse medication, as ODTs disintegrate rapidly after administration and prevent surreptitious behaviors such as "cheeking," pouching, or spitting pills out
- ODT formulation may also reduce misuse of medications (e.g., stimulants) that can have the potential for abuse, misuse, or diversion

Cutler AJ, Mattingly GW. CNS Spectr. 2017;22(6):463-474.

Immediate Release and Extended Release

Product name	Daily dosage	T_{max} (mean, hours)	$T_{1/2}$ (mean, hours)
Methylin (methylphenidate hydrochloride chewable tablets)	2 - 3	1-2	3
QuilliChew ER™ (methylphenidate hydrochloride for extended-release oral suspension)	1	5	5.2

- Long-acting chewable tablets now available
- Dosed once daily in the morning
  - Single dose in the morning significantly improved ADHD symptoms over placebo, with the treatment effect lasting for over 8 hours
  - Good for patients who have difficulties swallowing intact pills and patients who prefer to chew their medications

Liquid Dosage Forms of Long-Acting Stimulants

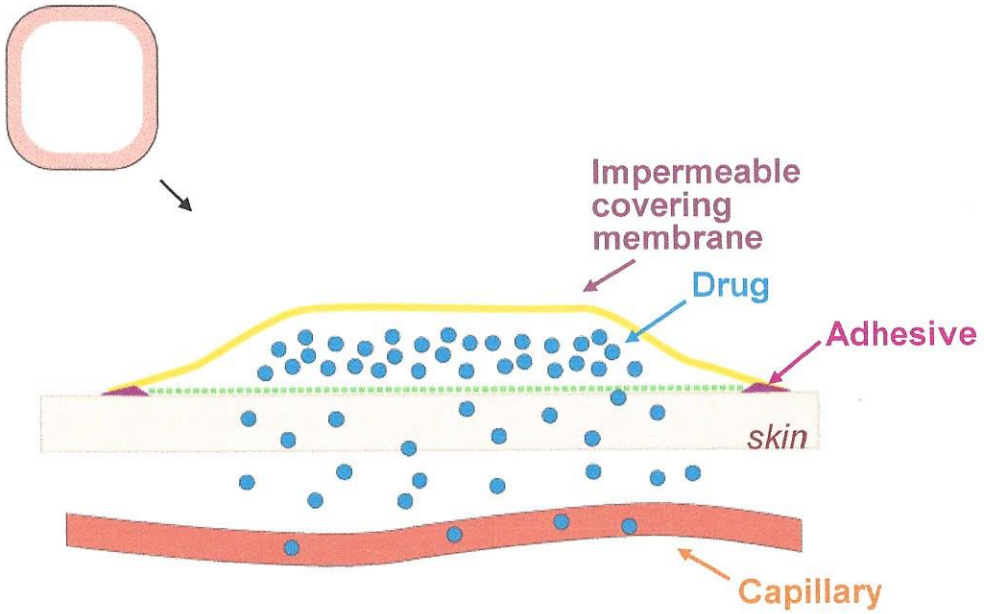
Methylphenidate Oral Suspension

- Quillivant XR® (approved in 2012)
  - powder that needs to be reconstituted with water prior to dispensing
  - dosed once daily in the morning, with the treatment effect taking place within 45 minutes and lasting for 12 hours

Amphetamine Oral Suspension

- Dyanavel™ XR (approved in 2015)
  - powder that needs to be reconstituted with water prior to dispensing
  - dosed once daily in the morning, with the treatment effect taking place within 45 minutes and lasting for 13 hours
- Adzenys ER™ (approved in 2017)
  - orange-flavored oral suspension; does not require reconstitution or refrigeration
  - once-daily medication approved for patients aged ≥6 years

Transdermal Formulations: Patch



Stahl, Mignon. Stahl's Illustrated Attention Deficit Hyperactivity Disorder 2009.

Methylphenidate Transdermal System

- The methylphenidate transdermal system (MTS) is a non-oral delivery system for methylphenidate
  - Consisting of a transdermal patch with a multipolymeric adhesive matrix that serves to both hold the drug and adhere to the skin
  - The MTS utilizes DOT Matrix technology to create a diffusion-based patch that contains drug in a semi-solid layer

Orally Disintegrating Tablets (ODT)

- Long-acting ODTs not only ease ingestion but also offer the convenience of once-daily dosing

Product name	Daily dosage	T_{max} (mean, hours)	$T_{1/2}$ (mean, hours)
Adzenys XR-ODT™ (amphetamine extended-release orally disintegrating tablets)	1	*d*-amphetamine: 5	*d*-amphetamine: 11 (in adults) *d*-amphetamine: 9-10 (in children)
		l-amphetamine: 5.25	*l*-amphetamine: 14 (in adults) *l*-amphetamine: 10-11 (in children)
Cotempla XR-ODT™ (methylphenidate extended-release orally disintegrating tablets)	1	4-5	12

Potential Benefits of ODTs

- May enhance compliance
  - In individuals with swallowing or tactile issues
  - In pill-averse patients who willfully refuse medication, as ODTs disintegrate rapidly after administration and prevent surreptitious behaviors such as "cheeking," pouching, or spitting out pills
- May also reduce misuse of psychotropic medications (e.g., stimulants) that can have the potential for abuse, misuse, or diversion

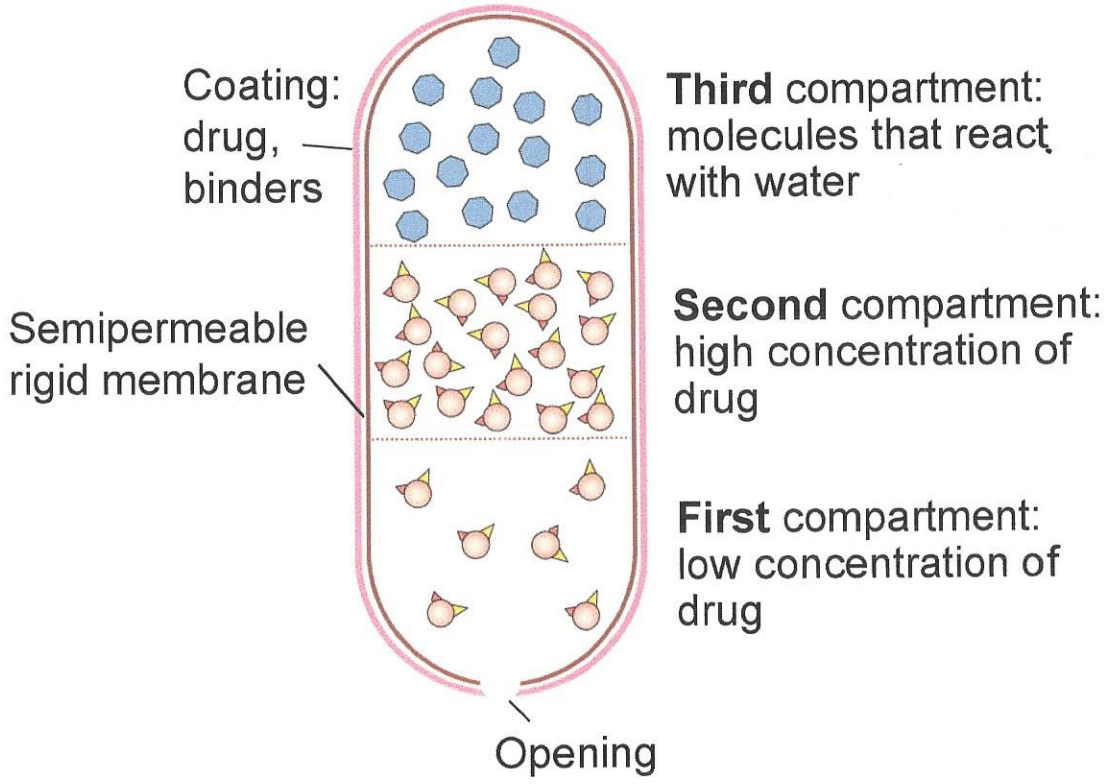
Cutler AJ, Mattingly GW. CNS Spectr. 2017;22(6):463-474.

Modified-Release Formulations

- Mechanisms
  - Matrix vs. reservoir
  - Single-unit vs. multiparticulate
- Differentiating factors
  - Transit time in GI tract
  - Location of drug release
  - Dissolution of active molecule
  - Permeation through GI membrane
  - First-pass clearance
  - Intestinal degradation

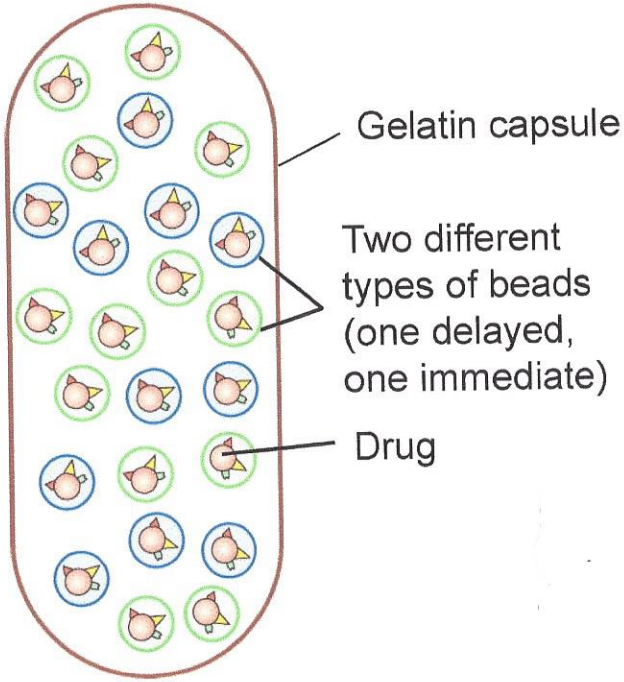
Chen ML et al. Eur J Pharm Sci 2010;40:148-53.

Osmotic Controlled-Release Oral Delivery System (OROS)



Stahl, Mignon. Stahl's Illustrated Attention Deficit Hyperactivity Disorder 2009.

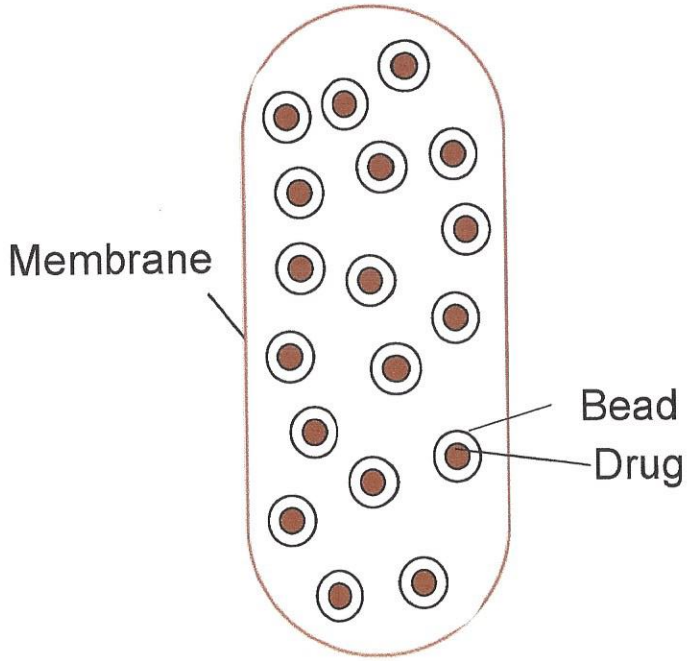
Multiparticulate System:
Multiple Bead System



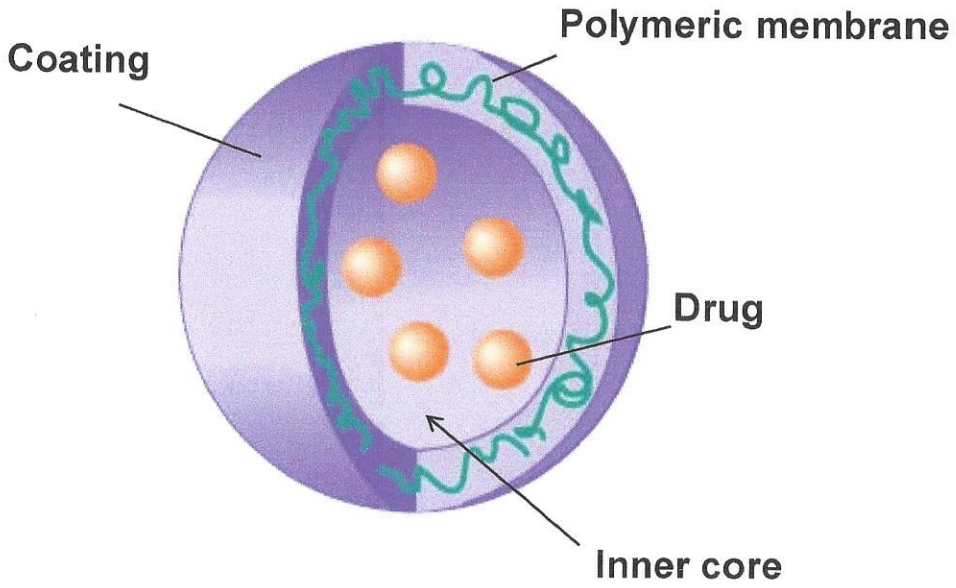
Stahl, Mignon. Stahl's Illustrated Attention Deficit Hyperactivity Disorder 2009.

Modified-Release Technologies:
Single-Unit vs. Multiparticulate Pellet Systems

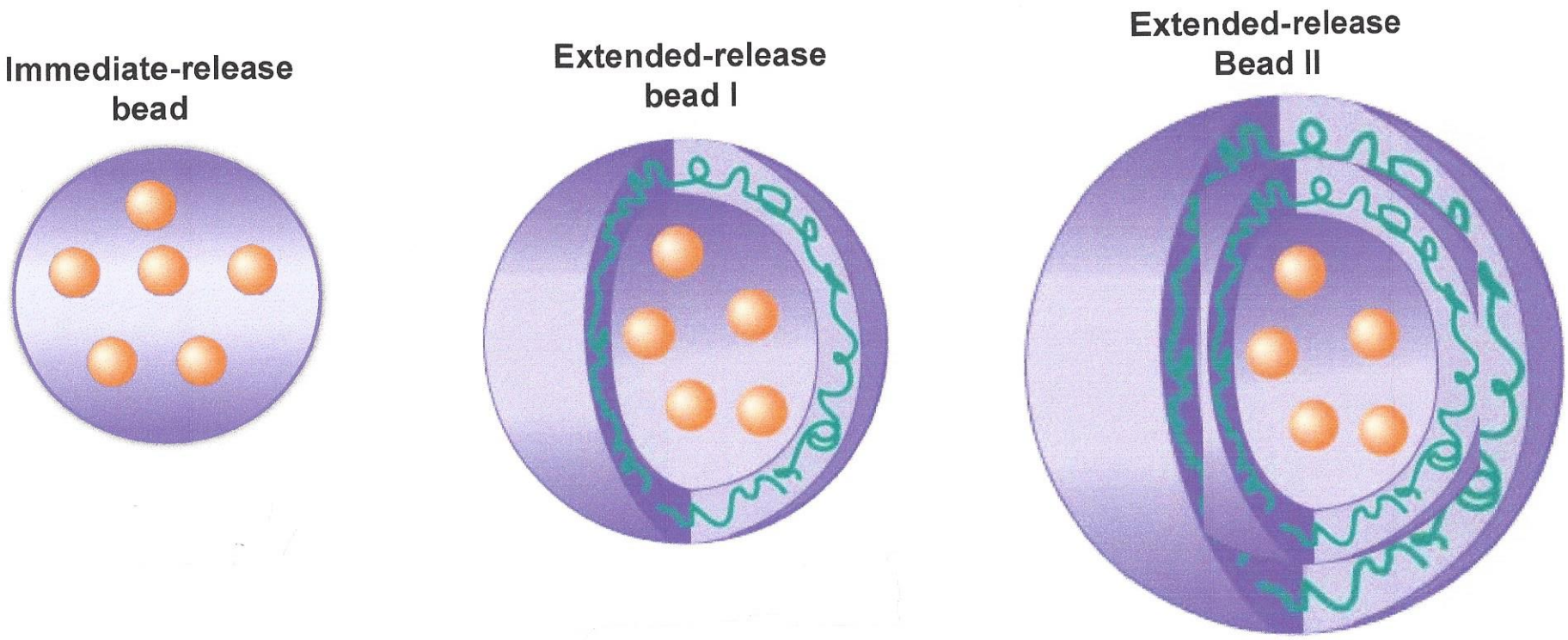
- **Advantages of multiparticulate**
  - Less dependent on gastric emptying rate
  - Less subject variability in GI transit time/dietary state
  - Less local irritation
  - Less risk of dose dumping
  - More flexibility for complex release



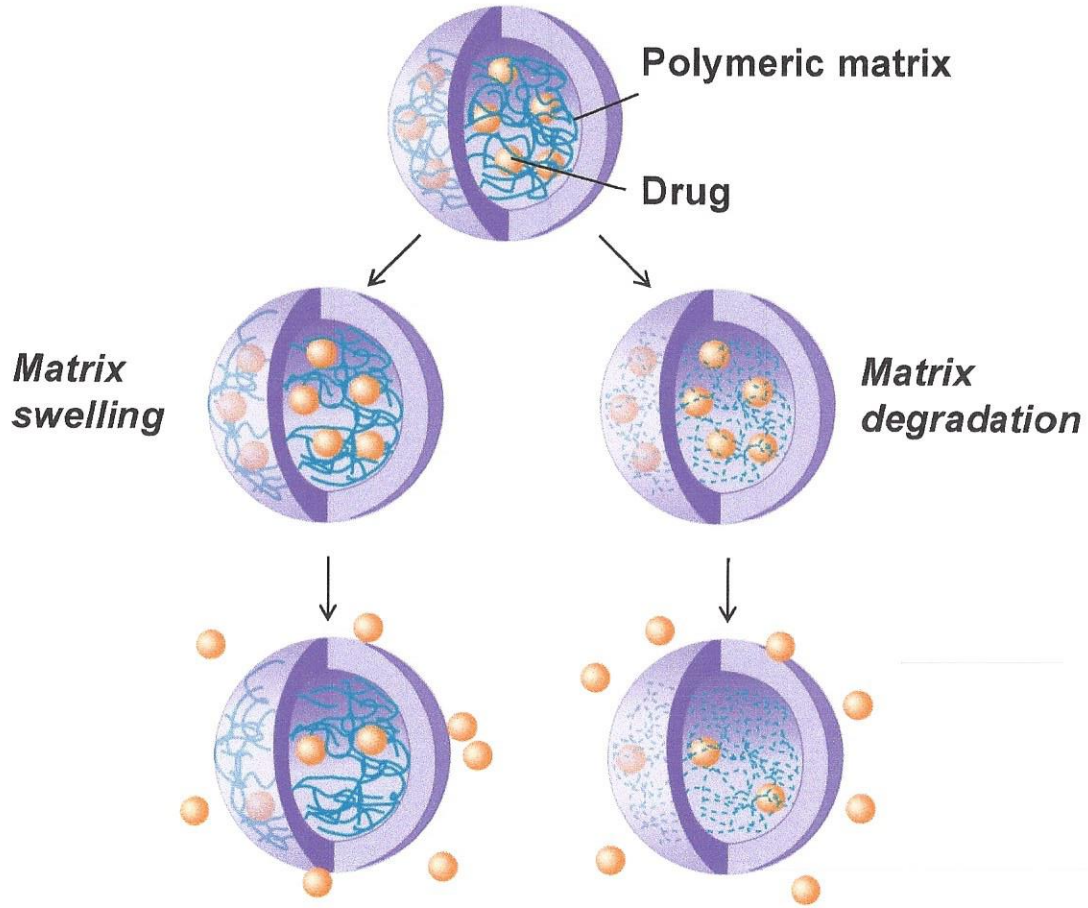
Modified-Release Technologies:
Reservoir System



Triple-Bead Technology



Modified-Release Technologies:
Matrix System



Coating

- Differences in drug release depending on type of coating
  - Insoluble
  - pH dependent
  - Slowly erodible

Lecomte F et al. Pharmaceut Res 2004;21(5):882-90.

Novel Formulation to Provide Early-Morning Control of Symptoms

- Novel formulation of methylphenidate that is taken in the evening instead of first thing in the morning to provide early-morning control of symptoms
- **Jornay PM (MPH DR/ER, HLD200)**: FDA approved August 9, 2018 for children aged 6 years and older
  - Taken at 8:00 PM (timing of administration may be adjusted to between 6:30 PM and 9:30 PM) to optimize the tolerability and the efficacy the next morning and throughout the day
- Utilizes novel, proprietary drug delivery platform, Delexis
  - Two functional film coatings to achieve a unique pharmacokinetic profile
    1. First layer delays the initial release of drug for up to 10 hours
    2. Second layer helps to control the rate of release of the active pharmaceutical ingredient throughout the day

Non-Stimulants

- Atomoxetine (approved ages 6 and up)
- Guanfacine ER can help with sleep disturbances approved for children/adolescents (monotherapy or adjunct to stimulants)
- Clonidine ER can help with sleep disturbances approved for children/adolescents (monotherapy or adjunct to stimulants)

Off-label:

- Bupropion (positive controlled adult trials)
- Desipramine (positive adult trial)
- Modafinil (positive child study; negative adult study)

Atomoxetine

Uses

- Uncomplicated ADHD
- Refractory ADHD
- Comorbid ADHD
  - **Anxiety** or depressive disorders
  - **Tic disorders**
  - Disruptive disorders
  - Substance use disorders

Current Treatments Remain Limited

- <40% of HCPs who treat ADHD are satisfied with the treatment options available to them
- Respondents were more satisfied with stimulants than nonstimulants
  - Common treatment challenges included breakthrough symptoms, price and access, and crash after medication wears off.
- For potential new treatments, the following attributes were most desirable:
  - All-day coverage
  - Low potential for abuse or diversion
  - Once-daily dosing
  - Reliable effectiveness
- 94% advocated for education about current and emergent ADHD treatment options

HCP: health care professionals.

Jain R, Mattingly G, Pikalov A et al. Unmet needs in the treatment of pediatric and adult ADHD. Poster presented at Psych Congress 2017; September 16-19, 2017; New Orleans, LA. Poster 216.

Conclusions

- While ADHD is diagnosed through its core symptoms, associated factors and comorbidities play an important role in treatment
- ADHD is treated to improve both core and associated symptoms
- Medication and therapies both under study and currently used are important parts of treatment
- Satisfaction with available treatments is limited, suggesting a need for additional treatments with new mechanisms of action