Why Are There So Many Medications for ADHD?
By Dr. Larry Silver

Introduction
ADHD is a neurologically-based disorder resulting from a deficiency of a specific neurotransmitter or group of neurotransmitters in specific areas of the brain. Neurotransmitters are the chemicals in the space between nerve cells (the synapse) that transmit signals from one nerve cell to the next. The primary neurotransmitter involved is called norepinephrine. Two of the building blocks needed to produce this neurotransmitter, dopa and dopamine, are also involved. The purpose of the primary medications used to treat ADHD is to stimulate specific cells within the brain to produce more of the deficient neurotransmitter. These medications are called "stimulants." There is a small group of other medications, the "non-stimulants," that use a different mechanism to raise the level of the deficient neurotransmitter. These medications slow down how quickly the transmitter is broken down and reabsorbed, resulting in it staying in the synapse longer, thus increasing the amount present.

There are two primary stimulant medications, methylphenidate and dextroamphetamine. (These terms are called the "generic" form of the product.) All other medications are variations on these two medications. These stimulants might be designed using different release mechanisms, absorption sites, or doses. Pharmaceutical companies use different trade names for their ADHD medications; thus, there are many products advertised to treat ADHD, but each is one of these generic products.

The Stimulant Medications
For each medication, there are several important characteristics. First is the target dose expected to be in the blood, and thus the brain, at any one time. The second is the release mechanism and, thus, the length of time the medication will remain available and active. Products can have different brand names, even if the only difference is the release mechanism.

The Target Dose: Each product releases a specific amount of the medication into the blood over a given period of time. The Food and Drug Administration (FDA) requires that the number value for each product represent the total amount of the medication in the tablet/liquid/capsule/patch and not the amount in the blood. Do not be confused by the number assigned to the prescription. This number represents the total amount of the medication in the product and not the amount in the blood stream at any one time.

The Release Mechanism: Each of these medications might come in the form of a tablet that releases all of the medication within about an hour. The medication will last about four hours. Each might come in a form that lasts about eight hours. This form might be an eight-hour tablet that releases about half of its contents immediately and half about four hours later. Or the form might be an eight-hour capsule with tiny pellets inside. These pellets are designed to release about half of the product immediately and half about four hours later.

One product, Concerta, is designed to last 12 hours. The capsule does not dissolve. Within the capsule there is a sponge on the bottom, the medication on top, and a tiny hole above the medication. As the capsule passes through the gastrointestinal track and absorbs moisture, the sponge expands and slowly pushes the medication out of the hole. Some products are liquid. The information provided will state how much medication is in each unit of liquid. One type of Concerta is
released by a dermal patch. For both capsules and patches, the number assigned represents the total amount in the capsule or patch and not the amount released during any period of time.

### The Methylphenidate Family of Medications:
- Methylphenidate (generic form)
- Ritalin (brand name)
- Metadate (specific brand form)
- Methylin (brand liquid form)
- Concerta (brand 12-hour release)
- Datrana (brand methylphenidate patch)

- Types of Methylphenidate
  - Liquid (Methylin)
  - Four-hour tablets as 5 mg, 10 mg, or 20 mg
  - Eight-hour tablets as Ritalin SR or Metadate ER
  - Eight-hour capsules as Ritalin LA or Metadate CD
  - Twelve-hour capsule as Concerta
  - Eight-hour Dermal Patch as Datrana 10, 15, 20, 30

### The Dextro-Amphetamine Medications
- A four-hour tablet
- An eight-hour capsule (spansule)
- An oral solution, (brand Procentra)
- Focalin (brand dextro-methylphenidate)
  - a four-hour tablet
  - an eight-hour capsule, called Focalin XR

### Adderall is available as:
- Four-hour tablets
- Eight-hour capsules (called Adderall XR)

### A slower-to-be-absorbed capsule called Vyvanse is available in 20 mg, 30mg, 40 mg, 50 mg, 60 mg and 70 mg strengths.

### The Non-Stimulant Medications

#### The Alpha-2 Agonists:
One group of non-stimulant medications is called "beta blockers." They are most often used to lower blood pressure. These medications raise the level of norepinephrine by slowing down how quickly this transmitter is broken down and absorbed within the synapse. They can increase stimulants’ effectiveness. These medications work best on impulsive behaviors.

- **Clonidine**, or Catapress, is often sedating, so it may be difficult to use during the day. If used at bedtime, it may counteract the problem of falling asleep often found with the stimulant medications.

- **Guanfacin**, or Tenex, is used to treat tic disorders. Some studies suggest that it might help to address the impulsivity and behavioral difficulties found with ADHD. A newer brand product of guanfacin, Intuniv, comes in an eight-hour extended release tablet.

#### Atomoxetine, or Strattera, is a non-stimulant medication, but it is not a beta blocker. It is a selective norepinephrine reuptake inhibitor. It works by slowing down the breakdown and absorption of norepinephrine in the synapse. It may also impact the level of a different neurotransmitter, serotonin. Strattera is given once a day and lasts the full day. The proper dose for each individual must be determined by increasing the dose until benefits are noted.

### Summary
There are many medications available to treat ADHD, but only because the basic two generic medications are available in many variations. Each may have a different chemical structure, mix of products, or release mechanism. Each may have a different brand name. The reality is that there are only a few medications that treat ADHD, but many variations on the theme.

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