

## Many Formulations of Stimulants Used to Treat ADHD

Children with attention deficit/hyperactivity disorder (ADHD) have difficulty paying attention, and they may have excessive energy and act without thinking. ADHD is quite common, affecting 5–9% of children. Unfortunately, the condition commonly causes children to perform poorly in school. Treatment for ADHD usually involves educational interventions made in the classroom, medications, or a combination of both.

Drugs that act as stimulants are prescribed for many children with ADHD. Stimulant medications increase the concentrations of brain chemicals, primarily dopamine and/or norepinephrine, which helps brain cells communicate with each other. Stimulants increase attention span, making children with ADHD better able to complete tasks and follow directions. At present, 19 different stimulant medications are available.

A recent article reviewed the different types of stimulants. The drugs differ in how fast they start to work and how long their effects last, and their availability in different formulations such



as tablets, capsules, liquid, or even patches. The following will provide a brief overview of some of the products that are available.

### METHYLPHENIDATE

Ritalin is a common brand name for methylphenidate. Initially, methylphenidate was only available in forms that released the drug immediately. These drugs act quickly and do not last in the body very long, so patients have to take the drugs 2–3 times a day. They are not often recommended for children since they would need to take medication during the middle of the school day. However, one advantage of these products is that they are safe to crush and mix into foods. This is helpful for children who are unable to swallow pills.

The next development in methylphenidate derivatives was drug formulations that slowly release medication over 8 hours. Brand names include Methylin ER, Metadate ER, and Ritalin SR (ER and SR stand for extended-release and sustained-release). Although the effects of these

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American Academy of Family Physicians  
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Based on “An Update on CNS Stimulant Formulations in Children and Adolescents with Attention-Deficit Hyperactivity Disorder” by Benjamin Chavez, Michael A Sopko Jr, Megan J Ehret, Raphael E Paulino, Kyle R Goldberg, Kristine Angstadt, and Gregory T Bogart, *The Annals of Pharmacotherapy*, June 2009, <http://dx.doi.org/10.1345/aph.1L523>. For Our Patients is provided by *The Annals* to help explain the latest research and information relating to your medications. These summaries are for informational purposes only and are not a substitute for professional advice from your personal medical provider. If you have questions about this material, you should discuss it with your physician or pharmacist. This summary may be reproduced without permission for not-for-profit educational purposes only. Any other use must be approved by the publisher. © Copyright 2009, Harvey Whitney Books Company, [www.hwbooks.com](http://www.hwbooks.com). FOPF7 DOI 10.1345/fop.1L523

drugs last longer than the immediate-release medicines, they usually still need to be taken twice a day; otherwise, children's symptoms return in the late afternoon. Unlike the immediate-release drugs, these products cannot be cut or crushed.

Concerta is another brand of methylphenidate that releases drug over 12 hours. This is convenient because the drug only has to be taken once a day, allowing children to avoid taking medication at school. Like the extended-release methylphenidate options, Concerta cannot be crushed.

Similar to Concerta, Ritalin LA (LA stands for long-acting), is given once a day. However, Ritalin LA starts working faster and works a little differently compared with Concerta. Half of each Ritalin LA tablet releases the drug immediately, while the other half is delayed-release, releasing the drug approximately 4 hours later. The effects of this formulation are similar to those of taking immediate release tablets twice a day, with the added advantage of having to take only a single pill. Some studies have suggested that stimulant drugs work better for children when a concentrated amount of drug reaches the brain twice each day.

Metadate CD is another form of methylphenidate that is administered just once a day. With this formulation, 30% of the drug is released from the tablet immediately while the other 70% of drug is released gradually over several hours.

The first and only methylphenidate patch, Daytrana, is available for children who cannot swallow pills. The patch is applied to a child's hips, below his or her underwear. Each day, a new patch should be applied in a slightly different place since the patch causes redness and irritation of the skin. Because it takes the patch a little longer than the pills to start working, some experts suggest putting the patch on children early in the morning while they are still sleeping. At the end of the day, once the patch is removed, the drug's effects continue for about 3 more hours. Children can wear the patch while swimming or exercising.

Most medications that contain methylphenidate contain a mixture of methylphenidate chemicals: one of the chemicals is inactive, while the other is active. The active form of methylphenidate, called dexamethylphenidate, is available by prescription in either an immediate-release (Focalin) or extended-release (Focalin XR) form. Since dexamethylphenidate is the active form of

methylphenidate, a child's dose of dexamethylphenidate is usually half of their corresponding dose of methylphenidate.

## AMPHETAMINES

Amphetamine products contain one or more amphetamine salts. Because amphetamines work a bit differently than methylphenidate, they are more likely to raise blood pressure, speed breathing rate, and slow down heart rate. A trade name of a product that contains 4 different amphetamine salts is Adderall. Immediate-release Adderall products can be crushed for children who cannot swallow tablets. Adderall XR (extended-release) capsules contain small beads of drug that control the release of the stimulant. Half of the beads are designed to release drug immediately, while the other half of the beads delay release for 4–6 hours. This prolongs the effects of the drug in the body.

Dextroamphetamine, another type of amphetamine, is available in both immediate-release tablets (Dextrostat) and sustained-release capsules (Dexedrine). A liquid form is expected to be available soon.

A derivative of dextroamphetamine called lisdexamfetamine (Vyvanse) has the amino acid lysine attached to the drug. In the intestines, bacteria release lysine from the drug, allowing the dextroamphetamine to be absorbed. Because the drug is not activated until it reaches the intestine, lisdexamfetamine will not cause a "high" if it is snorted up the nose. This amphetamine derivative may have advantages for individuals with a history of abusing medications.

The most common side effects with stimulant drugs are loss of appetite (and accompanying weight loss) and difficulty falling asleep. Both of these side effects can be decreased by not taking the medications before meals or near bedtime. Occasionally the drugs can cause or worsen tics (repetitive movements or sounds) and some stimulants that contain amphetamine may increase blood pressure.

As you might expect, newer stimulants with complex drug-release mechanisms are more expensive than older immediate-release drug forms. If cost is a concern, Ritalin and Adderall products are the cheapest because they are available generically. The availability of many different stimulant options increases the likelihood that you will find a product that best suits your child.