

# Medical Treatment for the ADHD Child

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One of the most difficult decisions you will face as the parent of an ADHD child, is whether to use medication. If your child has an infection, you may give an antibiotic for a few days, and the problem is resolved. In contrast, the drugs given to manage ADHD must be taken for months and sometimes years. You can't help but wonder how this long-term usage might affect your child. The following discussion will attempt to answer the most common concerns parents have about medication for attention deficit.

## **Psychostimulant Medication**

Psychostimulant medication is the most common treatment for children with ADHD. More children receive medication to manage ADHD than for any other childhood disorder. More research has been conducted on the effects of stimulant medications on the functioning of children with ADHD than for any other treatment modality for any childhood disorder. This extensive research helps us be fairly definitive about the benefits and liabilities of medication.

There has definitely been an increase in the use of stimulant medications in recent years. A recent study utilized several data sources to derive a best estimate of the use of methylphenidate over the years 1990-1995. These researchers found that approximately 1.5 million children, ages 5 to 18 years were on this type of medication. The estimate is that there has been a 2.5 fold increase during these years in the usage of methylphenidate for children with attention disorder. Some media pronouncements in recent years have stated that there has been a six fold increase in the use of stimulant medication. This comprehensive study strongly refutes the six-fold figure.

The increase in medication is thought to be a result of children being on medication for longer periods, an increase in the number of girls diagnosed and treated, and the increased inclusion of more children who have mainly the inattentive form of ADHD. Increased public acceptance of medication as a viable form of treatment for this disorder may also contribute to these trends.

It should also be remembered that during the 1980s a major media propaganda campaign was carried out by a certain religious group against the use of stimulant medication. The campaign, while inaccurate, did appear to cause a dramatic decline in the prescribing of this type of medication in the years preceding 1990. Part of the increase noted in the early 1990s, then, may just be a return to the pre 1987 prescription levels.

While the increased use of stimulant medication is obvious, the study found that only 50 to 60 percent of children who could be diagnosed as ADHD are actually being medicated. This finding does support the position that we are not overmedicating children who have ADHD. The general consensus is that the incidence rate for ADHD in the U.S. is 5 percent. Yet, only 2.8 percent of the children, 5 to 18 years of age, are being given stimulant medication.[Safer, 1996 #4]

## **Effectiveness of Medication**

Recently the National Institute of Mental Health released the Multimodal Treatment Study of Children with Attention Deficit Hyperactivity Disorder (MTA). This study is the longest and most thorough study ever completed comparing treatments for AD/HD. The study found that medication alone, or medication in combination with intensive behavioral therapy, was significantly superior to other types of treatment. [MTA Cooperative Group, 1999 #21]

Although medication alone was found to be more effective than intensive behavioral treatment, the combination of the two was necessary to produce a variety of improvements, and also led to the use of somewhat lower dosages of medication. Also, for the improvement of social skills and anger

management, behavioral treatment was found to be very beneficial and necessary. Medication alone, does not help a child make friends or know how to resolve conflict in appropriate ways.

In general, we can say that medication intervention is a significant help to ADHD children. Stimulant medication have been shown to be effective in improving behavior, academic work, and social adjustment in from 70 to 95 percent of children with ADHD.<sup>2</sup> How your child will respond depends on many factors. Therefore, each situation has to be carefully evaluated as to the best type of medication and dosage. There are certainly situations where medications are improperly administered. If medication is to be considered, it must follow strict controls, appropriate dosages, and careful monitoring.

## **Importance of Multimodality Treatment**

There may be grave consequences for persons with AD/HD who do not receive treatment or receive inadequate treatment. These consequences can include low self-esteem, social and academic failure, and a possible increase in the risk of later antisocial and criminal behavior. Treating AD/HD in children requires medical, psychological and educational intervention, and behavior management. This team approach to treatment is called "multimodal" and includes:

- parent training in diagnosis, treatment, and specific behavior management techniques
- an appropriate educational program
- individual and family counseling when needed
- training for the child on self-control and prosocial skills
- medication when required

The most important concept to emerge from the vast amounts of research about ADHD is that no treatment approach is successful alone. Neither medical, behavioral, psychological, nor educational intervention is adequate by itself. We must be conscious of treating the *whole* child or adolescent. Successful intervention makes a difference both on the short term and on the long term. We want to make changes which will help bring about the necessary confidence, competence, organization, discipline, and character in your child. We also want changes that will last a lifetime. The teacher may complain that your child won't sit still in the classroom. You may be unhappy that he can't remember directions. We must deal with those immediate concerns, as well as looking to his future needs. Giving the child 10 mg of Ritalin may help him sit in his seat and remember directions. However, it will not necessarily help him make friends.

Research has shown that multidisciplinary approaches to the treatment of ADHD work better, in the long term, than medication alone.[Cantwell, 1996 #6] Possibly one of the greatest benefits of stimulant therapy is that it maximizes the effects of concurrently applied treatments. What we often see is that the total treatment is far more effective than any of the components taken alone. Medication will not make your child act perfect, nor will it make her smarter. However, what it can do is to reduce many of her attention difficulties so that she can tackle her problems more successfully.

## **How the Stimulants Work**

The history of stimulant drug use dates back to the discovery by Bradley in 1937 of the therapeutic effects of Bensedrine on behaviorally disturbed children. In 1948, Dexadrine was introduced with the advantage of having equal efficacy at half the dose. Ritalin was released in 1954 with the hope it would have fewer side effects and less abuse potential. Today Ritalin or one of the other similar medications is used in a large percentage of cases where some type of stimulant medication is prescribed.

It is thought that stimulant drugs act by affecting the catecholamine neurotransmitters (especially dopamine) in the brain. Some believe that ADHD develops from a dopamine deficiency, which can be corrected by stimulant drug treatment. At one time it was felt stimulant drugs created a

paradoxical reaction in ADHD youngsters. The paradox was the calming response to taking a stimulant drug. This is no longer believed to be the case. We now have a better, although incomplete, understanding of how the calming reaction is produced in the brain.

Many parents feel guilty about having their child take medication because they mistakenly think they are tranquilizing him. This is simply not true. The medication helps stimulate the parts of the brain needed to concentrate and attend. The decrease in external movement does not mean he has been tranquilized. It means he is able to focus more effectively. When your child is watching TV or playing a video game, he may seem oblivious to the outside world. However, that doesn't mean he is tranquilized by the TV. Rather, his attention is temporarily focused so that he seems mesmerized, in contrast to his more usual distractible and inattentive condition.

Attention deficit results from the malfunction of the attention system. This system allows the brain to discriminate between situations where focused, deliberate behavior is appropriate and situations where quick, impulsive actions are needed. ADHD children are not able to control their attentional skills. They may be intently concentrating when they should be aware of their surroundings. On the other hand, they may be too easily distracted and ready to run off when they should be focused. Medication works to enhance the functioning of the attentional system, so that children can choose when to be sensitive to outside distractions and when to focus their attention. The attention center is stimulated by these medications with the result that the child has better control. In other words, with medication, the child is better able to put on the brakes. [Goldstein, 1990 #7]

The decision to proceed with medication intervention must be based on the comparison of the risks, benefits, and alternative treatments available. We will look at these considerations one at a time.

## **Short-Term Side Effects**

After reviewing 110 studies, including more than 4,200 hyperactive children, one researcher concluded that the primary side effects noted for stimulants were insomnia, anorexia or loss of appetite, weight loss, and irritability. These and other side effects were reported to be transitory and to usually disappear with a reduction in drug dosage.<sup>5</sup>

Most of these side effects appear at the beginning of treatment. For example, your child may say to you, "My stomach doesn't feel good." Usually this feeling is not nausea, although young children may locate the sick feeling in their stomach. These complaints normally last for about a week and may not be affected by whether the child takes the medication before or after meals.

Appetite suppression is common. Your child may be less hungry for a time. This may be less noticeable if the drugs are taken after meals, since the effects wear off before the next meal. Adjusting the dosage will often alleviate this symptom over a week or two. Since the effects of Ritalin last for only three to four hours, the dosage around mealtimes can usually be adjusted to avoid any serious problems with appetite. Make sure your child eats a good breakfast and dinner, and supplement with nutritious after-school and bedtime snacks. This helps avoid any temporary weight loss.

Other mild, but less common, side effects can include sadness, depression, fearfulness, social withdrawal, sleepiness, headaches, nail biting, and stomach upset. These symptoms will usually resolve spontaneously with a decrease in dosage. For example, if a child gets a headache right after taking the medicine, he may be taking too high a dose. Late-in-the-day headaches can also occur. These should be monitored closely. If they persist or are severe, the doctor will need to adjust the dosage. Some of these symptoms can be considered acceptable side effects in light of clinical improvement. The parents and physician will need to make the decision regarding the advantages of decreased distractibility versus side effects such as nail biting. These side effects are mild, but they can occur in some children treated with stimulant medication.

Toxic psychosis and seizures have occurred in a very few cases. The symptoms resolved when the medication was discontinued. Children with a family history of epilepsy may be at greater risk, and the physician should consider this when evaluating the possibility of stimulant medication treatment.

One side effect is the possibility of nervous tics produced by stimulant medications. A number of irreversible instances of Tourette's disorder have also been reported as a result of stimulant treatment. Tourette's disorder is a neurological condition composed of multiple, persistent motor tics and uncontrolled language. The combination of motor and vocal tics is considered an important diagnostic sign although they need not be occurring at the same point in time. It is essential that a child who shows signs of tics be carefully evaluated by an expert before ever taking any medication.

Perhaps fewer than one percent of ADHD children treated with stimulants will develop a tic disorder. Also, in 13 percent of the cases, stimulants may exacerbate preexisting tics. Therefore, it is prudent to screen children with ADHD for a personal or family history of tics or Tourette's disorder prior to initiating stimulant therapy.

Another side effect that has been reported is a "behavioral rebound" phenomenon. Typically, this is described as a deterioration in behavior that occurs in the late afternoon and evening following daytime administrations of medication. What parents report is that the child becomes very moody and irritable for the first hour or two after the medication has worn off. Research has suggested that this usually happens only for the first two or three weeks that the child is on the medication. If the problem continues or is severe, adjustments in the medication dosage and scheduling should resolve the problem.

The general consensus is that stimulant medication is relatively safe, but side effects do occur. In the vast majority of cases, either the side effects cease after one or two weeks of continued treatment, or adjustment in the dosage alleviates the problem. You can protect your child by making sure both you and your doctor are closely monitoring side effects as well as effectiveness. Most of the serious side effects show up right away. They will also disappear quickly if the drug is withdrawn. Then a trial of a different stimulant medication can be initiated.

## **Long-Term Side Effects**

There are no reported cases of addiction or serious drug dependence with these medications. Studies have examined the question of whether children on these drugs are more likely to abuse other substances as teenagers, compared to children not taking stimulant medications. The results suggest there is no increase in the likelihood of drug abuse. In fact some youngsters adopt a stand of staunch opposition to any drugs. More research is needed on this topic since all of the issues are not yet clear. However, the risk of future drug abuse appears to be quite low.<sup>6</sup>

Since ADHD is a long-term condition, medical treatment may be required for a prolonged period. This also raises the question of whether the child will become tolerant of the medication. The answer appears to be no. Over time, the child's dosages may need to be increased. However, this probably relates more to their increase in body weight than to their becoming tolerant of a certain dose, although it is possible for a few children to become tolerant of Ritalin. You and your doctor should continue to monitor its effectiveness very closely.

Another possible long-term side effect is the suppression of height and weight gain. Presently, it is believed that suppression in growth is a relatively transient side effect in the first year or so of treatment, and has no significant effect on eventual adult height and weight. Furthermore, there is evidence to suggest that if medication is discontinued at various points in the year, a growth rebound will occur. Most physicians will suggest a "drug holiday" especially for all or part of the summer to provide a catch-up period. One flaw in this idea is that children often have growth spurts in the summer, regardless of whether they are on medication or not. If you take your child off of the medication and he grows an inch or two, you might assume that this drug holiday caused the

growth spurt. Yet, it might have happened anyway, because this is the time when most surges in height and weight take place.

Meanwhile, the summer may have been anything but a vacation. If there was a resumption of the overactivity, impulsiveness, and distractibility, you need to evaluate the relative value of stopping the medication. Ultimately, these children will reach their projected adult height. Still, it is wise for the physician to monitor growth in children receiving stimulant medications.<sup>7</sup>

About the time they hit adolescence, a number of children who had cooperated previously become resistant to taking their medication. Parents begin to find pills fertilizing the ferns in the family room. If they are unaware of the noncompliance, parents might assume the medication is losing its effectiveness. In reality, the child has outgrown his willingness to take the medication.

Teens don't want to be different. Taking medication separates them from the crowd. Even time-released pills taken in the privacy of their own room may not overcome the resistance. Open discussion, careful supervision, and understanding of your child's feelings can help him work through this opposition.

### **Contraindications: Reasons for Avoiding or Stopping Medication**

With what we now know about stimulant medication, *contraindications* include: known hypersensitivity or allergic reaction to the drug; seizure history; glaucoma; hypertension; history of tics; hyperthyroidism; and pregnancy. One of the main objectives of the physical exam is to determine whether your child fits any of the predisposing categories. Liver disease, certain forms of heart disease, and high blood pressure are the clearest contraindications to stimulant therapy. Children with seizure disorders should probably not take stimulants, since the drug can lower the seizure threshold and increase the likelihood of seizures.

Doctors are also reluctant to use stimulants in children with a family history of tics, because stimulants can increase the possibility of tics developing. Stimulants can also aggravate anxiety. If a child who has ADHD is also quite anxious, an alternative to stimulant medication may be appropriate.

Most physicians will be reluctant to prescribe medication for a preschool child. Only if there are extreme symptoms, and if the child is a danger to himself, would stimulant medication be appropriated. The use of behavioral management techniques is a preferred method of treatment.

### **Benefits of Medication**

Between 70 and 90 percent of children appear to exhibit a positive response to stimulant medication. There seems to be three general categories of response to medication.

For about one third of the children, medication brings about a dramatic improvement. This would be the *miraculous* category. The effect is both immediate and obvious. Often within the first hour after treatment a perceptible change in handwriting, talking, motility, attending, organization, and perception may be observed. Classroom teachers may notice improvement in deportment and academic productivity after a single dose. Off-task activity levels seem to decrease and the child becomes more compliant and less aggressive. Parents will report a marked reduction in troublesome sibling interactions, inappropriate activity, and noncompliance. Even peers can identify the calmer, more organizing, cooperative behavior of stimulant-treated children.<sup>8</sup>

Another third of those who receive medication fall into the *moderate* category of responsiveness. While parents and teachers notice improvement in the child's attention and self-control, the effects are not astonishing. The child is definitely easier to teach because he's not quite so fidgety and distractible, but he still requires a ton of extra attention. Most children will fall into this category. There are significant improvements, but not wholesale changes.

The final third of children fall into the *minor* response category. Some children either don't respond or react poorly to medication. Despite all efforts to find the right medication at the right dose, a positive reaction is not obtained. In other cases, there is some positive effect on attention and self-control, but the side effects make the improvements not worth it. It has been estimated that 1 to 3 percent of children with ADHD cannot tolerate any dose of stimulant medication.<sup>9</sup>

In summary, the primary benefits are the improvement of the core problems of ADHD—hyperactivity, impulsivity, and inattentiveness. Attention span seems to improve and there is a reduction of disruptive, inappropriate, and impulsive behavior. Compliance with the commands of authority figures is increased, and children's peer relations may also improve, primarily through reduction in aggression. In addition, if the dosage is carefully monitored and adjusted, the medication has been found to enhance academic performance.

Medication does little to rectify any cognitive functioning or learning disabilities. If a child has visual or auditory processing deficits, medication will probably not change this learning problem. What it may do is help him pay attention better, so that remedial instruction will have more of a chance to impact the learning disability.

Although these medications are certainly helpful in the day-to-day management of ADHD, they have not been demonstrated to lead to enduring positive changes after their cessation. Research has been very clear that stimulant medications are not a panacea for ADHD, and should not be the sole treatment employed in most cases. The numerous skill deficits which these children have will still need attention and remediation.

It would be a mistake to assume that because a child responds to medication he must be ADHD. Likewise, it is an error to say a child is not ADHD, if he fails to respond to medication. This says nothing about his condition. It certainly does not indicate that his problems are any less real than those who do respond. The key is a thorough evaluation that identifies all of the child's needs, followed by a detailed treatment plan. Medication may be one component of that plan.

## When to Use Medication

One of the most difficult decisions for both the parent and clinician is deciding when to use medication. The fact your child has been diagnosed as ADHD does not imply an automatic recommendation for drug treatment. You want to make your decision based on accurate information about the nature and use of various medications and upon a clear understanding of your child's specific needs and family situation. It is important to be an informed consumer in this process. Don't be rushed into a decision. Yet, on the other hand, if there is the prospect of significant help being available to your child, don't procrastinate too long and allow your child continued unnecessary frustration and failure.

**Guidelines for Recommending Medication.** Doctors Barkely, DuPaul and Costello have identified the following guidelines regarding the decision to initiate a medication trial. I believe this is an excellent set of instructions, and would advise you to consider them carefully and discussion them with your physician before you start medication.

- Has the child had adequate physical and psychological evaluations? Medications should never be prescribed if the child has not been recently examined in a thorough manner.
- How old is the child? Pharmacotherapy is often less effective or leads to more severe side effects among children below the age of four and is therefore not usually recommended in such cases. In extreme situations, I have suggested a medication trial, but this is an exception.
- Have other therapies been used? Usually, we want to try some type of behavioral management, before medication is initiated. On the other hand, if your child has been experiencing a great deal of failure and his behavior is deteriorating, it may be wise to

bring about some improvement as soon as possible. Further, if your family cannot participate in child management training, medication may be the most practical initial treatment.

- How severe is the child's current misbehavior? In some cases, the child's behavior is so unmanageable or distressing to the family that medication may prove the fastest and most effective manner of dealing with the crisis. Once medication has been initiated, we can then proceed to implement other forms of intervention.
- Can you as a family afford the medication and associated costs? Long-term compliance is very important. You need to be willing and able to stick with the treatment program as long as your clinician recommends it. This means the \$60-\$120 per month for medication plus office visits.
- Do you feel able to supervise and monitor the use of the medications and guard against their abuse? If your own life is too disorganized and stressful, you may not be able to see that your child maintains the proper medication schedule.
- What is your attitude toward medication? Some parents are simply anti-drug and should not be coerced into agreeing to this treatment. If you really don't want your child on medication, your underlying attitude will probably sabotage its efficacy.
- Is there a delinquent sibling or drug-abusing parent in the household? If so, psychostimulant medication should not be prescribed, or security measures implemented, since there is a high risk of its illicit use or sale.
- Does your child have any history of tics, psychosis, or thought disorder? If so, the stimulants are contraindicated, as they may exacerbate such difficulties.
- Is your child highly anxious, fearful, or likely to complain of psychosomatic disturbances? Such a child is less likely to respond positively to stimulant medications and may exhibit a better response to antidepressant medications.
- Does your physician have the time to monitor medication effects properly? In addition to an initial assessment of drug efficacy and establishment of the optimal dosage, periodic reassessment of drug response and effects on height and weight should be conducted throughout the year.
- How does your child feel about medication and its alternatives? With older children and adolescents, it is important that the use of medication be discussed with them and its rationale fully explained. In cases where children are antidrug or oppositional, they may sabotage efforts to use it. Sometimes the "wearing glasses for a visual handicap" metaphor can help explain medication without a stigma.<sup>10</sup>
- If your teenager is considering service in the military, they should know that a diagnosis of ADHD and current or recent medication usage may be a basis to disqualify a person for entrance into the military. Some of the guidelines are not real clear, and may be subject to change. There may also be some variation among the various branches of the service. Check with the local recruiting office if this is an issue for your adolescent.

## Prescribing Procedures

Following is a description of the common medications used in the treatment of ADHD. This overview is provided for your education only. Be sure to discuss the specifics of medication with your physician.

**Stimulants.** "Psychostimulant" compounds are the most widely used medications for the management of AD/HD-related symptoms. Stimulant medications were first given to children with ADHD symptoms in 1937 and have been extensively researched since then.

Stimulants are sympathomimetic drugs that increase intrasynaptic catecholamines (mainly dopamine) by inhibiting the presynaptic reuptake mechanism (amphetamine, methylphenidate, and pemoline) and releasing presynaptic catecholamines (amphetamine).

Stimulant medication acts as a sort of "gate-keeper" in the brain which helps the brain better regulate the manufacture, storage and flow of its own neurotransmitters when needed by the brain. It is believed that psychostimulant medications change the levels of transmitter chemicals available to various neurotransmitter systems in the brain. These neurotransmitters are the means by which the different nerve cells communicate among themselves.

Prescribing stimulants for ADHD has changed in two fundamental ways. In the past we covered a child's symptoms only during school hours. More recently medication has been utilized for the time after school and on weekends and holidays. Second, there is now the availability of longer-acting stimulant preparations. These extended-release preparations are usually preferred for lack of in-school dosing requirements, improved compliance, reduced stigma and wear-off, and lower risk of abuse or diversion of the pills to a non-prescribed consumer.

The following sections will summarize the current range of medications available or soon to be available for the treatment of ADHD.

**Ritalin** (methylphenidate) has been available since 1954 and is available in 5, 10, and 20 mg tablets. Ritalin is water-soluble, which means that there are no traces of the medicine left in the system once it has stopped providing beneficial effect. Because of this, Ritalin needs to be re-administered every 3-4 hours to maintain a therapeutic level. Ritalin is not physically addictive because of the quick absorption and depletion, and because of the relatively small doses prescribed for ADHD.

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The usual dosage is .3 milligrams per kilogram (about 2.2 pounds) of body weight up to 1 milligram per kilogram in a 24-hour period. The usual starting dosage of the standard Ritalin for children under eight is a single 5 mg tablet in the morning, and for children over eight a single 10 mg tablet in the morning. Each week the daily dosage can be increased by 5 mg and 10 mg a day, respectively. Usually tablets are taken at breakfast and lunch. Occasionally an after-school dose is necessary. The total maximum daily dosage usually does not exceed 60 mg, although under some situations 80 mg/day dosages are prescribed.

The specific dose of medicine must be determined for each individual. There are ranges based on a medication dose per unit of body weight that are usually employed. However, there are no consistent relationships between height, age and clinical response to a medication. A medication trial is often used to determine the most beneficial dosage. The trial usually begins with a low, weight-based dose that is gradually increased until clinical benefits are achieved. It is common for the dosage to be raised several times during the trial. The patient is monitored both on and off the medication. For children, observations are collected from parents and teachers, even coaches and tutors. Parent and teacher rating scales are often used. In the case of an adult, the patient and significant family members share their impressions with the treatment team.

**Ritalin SR 20** is a sustained-release product with effects lasting six to eight hours. The mechanism of action releases 10mg initially and 10mg four hours later. Some physicians report unsatisfactory reliability with the sustained-release form of Ritalin with the child getting only about

8mg of actual medication benefit. It may be necessary to administer a 5-10mg standard tablet in the morning, along with the SR20.

**Ritalin LA** (methylphenidate extended release) was recently approved by the FDA for treatment of ADHD. This new long-acting dosage form allows once daily dosing that lasts for 8-9 hours, eliminating the need for additional doses of medication during the day. Ritalin LA comes in 20 mg, 30 mg, and 40 mg capsules.

Ritalin LA uses immediate and extended release beads within the capsule that provides a rapid onset of action followed by another release of methylphenidate approximately four hours later, ensuring two peak levels per day. Peaks and troughs during the day are thought to increase patient response. The older extended release product, Ritalin SR utilizes a wax matrix delivery system, which provides a slower onset and more continuous blood levels of methylphenidate over a 6-8 hour period. The new LA formulation offers patients an alternative form of dosing to improve compliance and quality of life.

Ritalin LA is taken by mouth, once each day in the morning, before breakfast. The drug may be taken with or without food, but food may slightly delay absorption. The capsules may be opened and sprinkled onto cool applesauce to administer the drug to children unable to swallow capsules. The beads should be mixed with the applesauce immediately before administration and not in advance.

**Focalin**, a refined formulation of Ritalin (d,l-methylphenidate HCl), has recently been approved by the FDA for the treatment of ADHD. Whereas Ritalin contains both the d and l isomers of methylphenidate, Focalin contains only the more active d-isomer. Isomers are compounds that contain the same number and type of atoms, but have different structures.

The pharmaceutical company studied the two forms of methylphenidate, dextro-methylphenidate and levo-methylphenidate, and found that the dextro form was significantly more potent than the levo form. Focalin is dextro-methylphenidate. Each tablet is described as having a faster onset of action and requires half the dose of Ritalin to achieve the same effect. Thus, half the dose that was used with Ritalin is needed. Some doctors are referring to Focalin as “Focused Ritalin”. It comes in a 2.5 mg, 5 mg, and 10 mg strength. This is equivalent to the 5 mg, 10 mg, and 20 mg Ritalin tablets. Each tablet lasts about four hours. Use with children under the age of six has not been established.

**Dexedrine** and **Dexedrine Spansules** are slower releasing medications that provide a longer window of benefit for many people. The length of time will vary, but often a student can expect the therapeutic level to last around 5-8 hours per dose. For a variety of reasons, teenagers often do better with one of these medications.

The amphetamines are quite similar in their pharmacologic makeup. **Dexedrine** (dextroamphetamine) has been available in the tablet form since the 1950s and comes in 5mg tablets; in a liquid elixir preparation with 5 mg per teaspoon; and in slow-release Spansules of 5, 10, and 15 mg. The generic form, Dextrostat, comes in a 10 mg strength.

The dosage is approximately half that of Ritalin. The slow release or Spansule version of Dexadrine may work better for some children than the Ritalin SR 20. Though dosage amounts are important, the timing of the daily medication schedule can be just as important to achieving positive results. The spansule is a capsule with small beads inside and releases in a steady strength of dose over eight hours. It can be opened and sprinkled over food.

Since methylphenidate is not approved by the FDA for use in children under the age of 6, dextroamphetamine may be preferable for children, ages 3 to 5. <sup>11</sup>

**Generic** formulations of methylphenidate and dextroamphetamine are also available. They will typically cost less than the brand name, and are sometimes required for insurance reimbursement.

Because there is greater latitude in the manufacturing process for generic versions, the actual pills may contain more or less of the active ingredient than the some formulation of the brand name. This might result in a more varied and unreliable response pattern by the child. All of this depends on how your child reacts to the medication. In many cases there may be no difference in how your child responds to the generic versus brand name form of the medication. Talk to your physician and get his or her opinion. It may be wise to start with the brand name formulation, and once you have a clear idea of how your child responds, then try the generic for a few weeks and see if you can tell any difference in the day-to-day behavior of your child.

Some doctors will also advise that patients do not take stimulant medication with aspirin or acidic foods such as citrus fruit or orange juice, because they can prevent absorption of the medication.

Another concern may be the yellow dye contained in the 5mg tablets of Ritalin. A few children have become more active and agitated when they took this version of the medication. It is possible to have an allergic reaction to the yellow dye contained only in the 5mg Ritalin tablets. If your child has an adverse reaction to the 5mg tablet, you might ask about trying the 10 or 20mg tablets of Ritalin which do not contain yellow dye.<sup>12</sup>

**Adderall** consists of mixed salts of a single-entity amphetamine product which combines amphetamine and dextroamphetamine. Adderall had previously been approved and marketed by another company under the name of Obetrol, indicated for obesity and ADHD. The new company, Shire Richwood, renamed the product Adderall in 1994 and completed the necessary FDA reviews. It is indicated for use in children 3 years of age and older. No generic version of Adderall is available at this time.

It is available in 5, 10, 20, and 30mg tablets. For children, the usually starting dosage is 5mg once or twice daily, increasing by 5mg weekly, until optimal response is obtained. Total dosages of 40 mg per day, or more, are rare. Adderall does last longer than Ritalin or Dexadrine, perhaps 6 to 8 hours. This may allow the child to avoid the noontime dosage necessary for the other stimulants.

**Adderall XR** is a newer, novel, extended-release formulation of Adderall which is designed to provide symptom control in the morning and throughout the day with just one morning dose. **Adderall XR** capsules contain both immediate release and delayed release beads in a 50:50 ratio designed to deliver a double-pulse delivery of amphetamine. Fifty percent of the beads release immediately and 50 percent are released slowly over about 8 hours. Thus, the Adderall XR 10 releases 5 mg immediately and 5 mg over the remaining time. The XR 20 releases 10 immediately and 10 over time. And, the XR 30 releases 15 mg immediately and 15 mg over time. Adderall XR comes in 5, 10, 15, 20, 25 and 30 mg capsules. Like the other capsules with beads, it can be opened and sprinkled over food.

**Metadate** is a longer-acting methylphenidate. It comes in two forms, **Metadate ER** and **Metadate CD**. Metadate ER is designed to last eight hours. It comes in a 10 mg and a 20 mg strength. The Metadate ER 10 mg releases the equivalent of 5 mg initially and 5 mg four hours later. The Metadate ER 20 mg releases the equivalent of 10 mg immediately and 10 mg four hours later. Both the 10 and 20mg tablets are color-additive free. The surface of the tablet can not be broken. If it is, all of the medication is released immediately.

**Metadate CD** is the newest form of this brand and lasts eight hours. It is a capsule with multiple beads inside. Six mg are released initially and 14 mg are released over the remainder of time. Unlike the Metadate ER, the capsule can be opened and the beads sprinkled over food and taken in this way.

**Concerta** was the first once-daily treatment for ADHD getting approval in the Fall of 1999. Because of its unique release mechanism, the therapeutic level is maintained for 12 hours. Its active ingredient is methylphenidate, and it is available as an extended-release tablet in 18, 36, and 54mg strengths of methylphenidate HCL). Each tablet is designed to have a 12-hour duration of effect.

Concerta 18mg is approximately equivalent to Ritalin 5mg three times a day. Concerta 36mg approximately equals Ritalin 10mg three times a day. Concerta 54mg equals Ritalin 15mg three times a day.

Concerta uses osmotic pressure to deliver methylphenidate HCl at a controlled rate. The system, which resembles a conventional tablet in appearance, consists of a semipermeable rate-controlling membrane surrounding an osmotic core, which contains a push layer and a drug layer. Once in the body's gastrointestinal tract, water enters the OROS® system and dissolves or suspends the drug in the tablet's core. The drug is then released through one or more laser-drilled holes in the membrane at a controlled rate. The drug overcoat dissolves within one hour providing an initial dose of methylphenidate. The medication is then released gradually in a smooth pattern, improving attention and behavior throughout the day.

Due to its controlled release, Concerta minimizes the peaks and valleys associated with other medications when they are taken more than once per day. This once-a-day dosing eliminates the need for in-school and after-school dosing. Some physicians report fewer side effects with Concerta even though the active ingredient is the same as Ritalin.

Concerta should be taken in the morning, with or without breakfast and swallowed whole with the aid of liquid. It should not be chewed, divided, or crushed. Dosage above 54mg per day is not recommended. Its usage for children under 6 years has not been established.

### **Methylin**

The FDA recently approved Methlyn Oral Solution and Methylin Chewable Tablets as a safe and effective treatment for ADHD in children six and above. The chewable form is a rounded-square grape flavored tablet that can be chewed and swallowed two or three times a day to provide all day relief from ADHD symptoms. The chewable tablets come in 2.5, 5 and 10 mg doses.

Methylin Oral Solution is a grape flavored colorless liquid formulation that can be taken two or three times a day. It comes in 5mg/5ml and 10mg/5ml doses. It does not contain alcohol, sugar, lactose or dyes.

These formulations can be a great help for children who have trouble swallowing their pills.

### **Methylphenidate Patch**

Noven Pharmaceuticals is developing a once-daily MethyPatch® (transdermal methylphenidate system). MethyPatch incorporates Noven's patented DOT Matrix™ patch technology in the treatment of ADHD. MethyPatch combines methylphenidate with Noven's patented DOT Matrix patch technology, which is the delivery platform underlying Noven's Vivelle-Dot® and CombiPatch® hormone replacement patches. DOT Matrix technology permits Noven to deliver predictable therapeutic doses of a range of prescription therapies through discreet, comfortable and adherent patches that are well suited to active lifestyles

If approved by the FDA, it will be the first transdermal therapy available for ADHD.

### **Other Medications**

#### **Strattera**

Initial studies demonstrated promising results for the nonpsychostimulant Strattera (**atomoxetine**). Atomoxetine is a potent inhibitor of the presynaptic norepinephrine transporter. Atomoxetine is presumed to work by blocking a neurotransmitter that plays an important role in modulating the brain systems that control attention and activity. In practice, Strattera has not been found to be as successful as the stimulants, but when it does work, it seems to be effective with minimal side effects.

The need for alternative and effective nonstimulant pharmacological treatment options is evident, as an estimated 30 percent of children, adolescents and adults with the disorder do not respond, or cannot tolerate, treatment with a stimulant medication. Growing concern over issues related to prescribing controlled substances long term, including their potential for diversion, has also generated considerable support for the development of alternative nonstimulant treatments.

While the new all-day stimulant formulations have succeeded in reducing the need for multiple dosing throughout the day, their use may induce sleep disturbances, such as insomnia.

Strattera appears to offer a new alternative to stimulants with excellent symptom control but without abuse liability. Strattera works by selectively blocking the reuptake of norepinephrine, a chemical messenger, or neurotransmitter, by certain nerve cells in the brain. This action increases the availability of norepinephrine, which is thought to be essential in regulating impulse control, organization and attention.

Treatment with atomoxetine appears to significantly improve ADHD symptoms and is generally well tolerated at all doses. The relatively benign side effect profile of atomoxetine is especially promising. No serious side effects or changes in cardiac conduction have been associated with atomoxetine. There were some small amounts of weight loss in preliminary studies.

Several nonstimulants that have been shown in studies to be efficacious for ADHD include some of the tricyclic antidepressants (desipramine, protriptyline, nortriptyline) and bupropion, but dose-response and safety in the pediatric population merit further study. The tricyclics have an anticholinergic side effect profile and require EKG monitoring for cardiac conduction delays. Currently, no non-stimulant is approved for use in children with ADHD. However, atomoxetine appears to offer a safe alternative to stimulants and tricyclic antidepressants with excellent symptom control.

Strattera has now been approved for use and could be a valuable addition to the treatment options for ADHD. It is available in 10, 18, 25, 40 and 60mg capsules. It cannot be chewed or crushed. Strattera capsules should never be broken and sprinkled on food. They must be taken whole, but can be taken with or without food.

**Cylert** (pemoline) is taken once a day, giving it an advantage over the shorter-acting preparations. It has a gradual onset of action. Significant clinical benefits may not be evident until the third or fourth week of treatment, and they may take as long as six weeks. The drug is available in 18.75, 37.5, and 75 mg tablets; and in 37.5 mg chewable tablets. The recommended starting dose is 18.75–37.5 mg and the dosage is increased in daily increments of 18.75 mg per week until the desired clinical effects are reached. The effective daily dose for most patients is in the range between 56.25-75 mg. The maximum daily dose is 112.5 mg. Because of its association with life threatening hepatic failure, Cylert should not ordinarily be considered as first-line drug therapy for ADHD. If used, initial and periodic liver function tests are required.

**Tricyclic antidepressants** including **Tofranil** (imipramine) and **Norpramine** (desipramine) have also been prescribed for the treatment of ADHD. **Pamelor** (nortriptyline) is another tricyclic that may be used. The bulk of the research suggests that overall, psychostimulants tend to be superior to the tricyclics in managing ADHD symptoms. However, there may be a subgroup of children, particularly those who show signs of anxiety, depression, sleep problems, or who have tics or psychosis, who may respond better to the tricyclics. These medications can also help those who are having trouble with anger, inability to sleep or bed wetting. Desipramine may have fewer side effects and thus be preferable. These medications can also be used in conjunction with stimulant medications.

The antidepressant medications are taken by mouth once or twice a day, but do not wash out of the body as quickly as the stimulants. This means it may take several weeks to build up a

therapeutic level in the bloodstream. Side effects can include irregular heart rate, nervousness, sleep problems, upset stomach, dizziness, and dry mouth.

Another type of antidepressants are the SSRI's (selective serotonin reuptake inhibitors) such as **Lexapro** (escitalopram), **Prozac** (fluoxetine), **Paxil** (paroxetine), and **Zoloft** (sertraline). These medications increase the levels of the neurotransmitter serotonin by inhibiting the reuptake of serotonin, allowing it to remain active in the synapse for a longer period. These medications may be useful for children who have some mood disorder, including depression, anxiety, irritability, or who are highly aggressive. Improvement in attention span can result from this type of medication, but it is generally not as dramatic as the improvement seen with stimulants. Side effects can include nausea, mild weight loss, anxiety, headaches, sweating, or insomnia.

**Clonidine** (catapres) and **Tenex** (guanfacine) are antihypertensive medications that can also be used to treat ADHD symptoms. Clonidine is available in transdermal skin patches which allows the release of medicine evenly all day. Clonidine is less expensive than Tenex, but Tenex may cause less drowsiness during the day.

These medications have also been used for other disorders such as migraine headaches, schizophrenia, manic-depression, obsessive-compulsive disorder, panic disorder, and anorexia nervosa. Dr. Robert Hunt at Vanderbilt University has found this type of medication also helps control oppositional behavior, anger, aggression, cruelty, destructiveness, explosiveness, and frustration. Since these medications are also used for treatment of Tourette's syndrome, they may prove useful in ADHD children who have tics or who have developed tics on methylphenidate. The primary side effect is tiredness, along with decreased blood pressure, dizziness and dry mouth.<sup>13</sup>

Some of the newer antidepressants such as **Wellbutrin** (bupropion), **Ludomil** (maprotiline), **Buspar** (busiprone), **Celexa** (citalopram), **Remeron** (mirtazapine), and **Effexor** (venlafaxine) have sometimes been prescribed for treating ADHD. Your physician will advise you on whether any of these would be appropriate for your child.

Under some conditions, medications such as **Provigil** (modafinil) used for sleep disorders and **Neurontin** (gabapentin), used for shingles and facial pain, as well as seizures, have been found to be useful for children with ADHD. Clinical trials are underway to see if Provigil could be approved as another nonstimulant medication for ADHD.

No matter which medication is employed, some common principles should apply. I have summarized the major ideas proposed by various authors in regard to the use of medication with ADHD children.

## Prescription Principles

1. The dose should be the lowest possible and be given only as many times per day as necessary to achieve adequate management of the child's behavior.
2. Medication can be discontinued on holidays or summer vacations. The question is whether the deterioration of behavior without medication is so severe as to make the drug holiday not worth the effort.
3. Titration (dosage) should be based on objective assessment of the child's resulting behavior and should start with the lowest possible increments.
4. Sufficient time (5 to 7 days for stimulants, up to 3 or 4 weeks for antidepressants) should be allowed for evaluation of the efficacy of each dosage.
5. Parents should never be given permission to adjust the dosage of medication without consultation with the physician. This often leads to overmedication of a child, since the parents may increase the dosage every time the child misbehaves.

6. Never force medication on a child or family, particularly adolescents.
7. The physician should provide accurate information to the family about all aspects of the medication.
8. Obtain objective measures of medication effectiveness. The child or teenager self-report is often not a accurate source for determining the effectiveness of the medication. Many patients say they cannot tell the difference, even though teachers and parents see significant improvements in behavior.
9. Trial-and-error efforts will often be needed to find tune the proper medication and dosage for your child. It may take weeks or months to find the best dosing schedule. Also be prepared that as your child grows older the medication program will also probably need to change.
10. Timing is a very important consideration in the medication process. You need to learn how long it lasts, how long it takes to kick in, when does it reach its maximum effectiveness, and how your child's daily schedule matches up to the medication pattern. For example, if your child begins to have trouble the last period of the school day, it may be because the medication was worn off. Appropriate changes would then need to be made.
11. Medication must be taken regularly and consistently. To accurately measure its effectiveness, the medicine must be taken at about the same time, and under the same conditions, every day.<sup>14</sup>

## **Evaluation of Medical Intervention**

The response of each child to medication is different. Therefore, it is important to collect objective data regarding changes in your child's behavior across several doses. The typical approach is to determine the child's optimal dose in the context of a double-blind, placebo-controlled assessment study that includes multiple measures of the child's behavior collected from the home, school, and clinic. Double-blind means neither the physician nor parent knows when your child is receiving the stimulant medication and when he is taking a neutral substance called a placebo. The use of a placebo reduces the effects of positive biases that can show up on rating scales when the rater knows the child is taking a medication. The problem with a blinded drug/placebo trial is that they are time consuming, expensive and often unnecessary for most children. Four types of situations have been identified which would suggest the more rigorous double blind trial.

One of these situations is that if the parents disagree with each other about whether to consent to a medication trial. The second is if the school personnel is advocating drug therapy while the parents are strongly opposed (or vice versa). A third condition is if a child is so anxious about being medication free during an off-drug trial, the doctors are concerned that his anxiety will interfere with an accurate assessment. The final condition is if the patient, often a teenager, is very noncompliant with the medication because he is convinced that he has no problems and that the medication has no effect. The trial may help show that medication does help.<sup>15</sup>

This type of process usually takes three weeks. During one of those weeks the child is on a small dosage of Ritalin, such as 5 mg. A 10 mg dosage is often used during another week, and the placebo occupies the third week. The sequence is known only to the nurse, technician, or pharmacist who prepares or dispenses the prescriptions. Sometimes the physician will try a combination of medications, such as Ritalin and Dexadrine, during the study. This may extend the trial to four weeks.

It is also important during this time not to make any drastic changes in school or intervention techniques. To do so would contaminate the effects of the medication. Later on, several different treatment strategies will be used for your child. However, for the time the medication study is taking place, don't make other changes.

At the end of each week, both the parents and teacher complete a rating scale of some type. This is done to objectively measure the child's behavior during that particular week. The types of measures used to make the original diagnosis of ADHD now offer a comparison point for your child's performances on medication. The initial standardized score your child received allowed the clinician to compare him to other children. Now, the weekly scores provided by the parent and teacher allow him to be compared to himself. If there are any improvements in behavior that correspond to the introduction of the various medications, your doctor can assume the changes are primarily due to the medication. If one level of dosage was also accompanied by the most significant improvements in behavior, that level may become the initial therapeutic dosage. Periodic measurements are necessary to evaluate the continued efficacy of the treatment.

Whether or not your physician uses a double-blind study, some type of objective measures are needed. The *Conner's Teacher and Parent Rating Scales-Revised (CPRS-R/CTRS-R)*, the *ADD Comprehensive Teacher Rating Scale (ACTeRs)*, the *Revised Home Situations Questionnaire (HSQ)*, and the *Revised School Situations Questionnaire (SSQ)* are often used for this purpose. Their purpose is to make sure the medication is actually helping your child. If the data and your observations don't support any improvement, then the medication must be adjusted or dropped.

Sometimes it takes a month or two to settle on a medication program that suits your child. Be patient. Don't drop the whole idea because there are no significant improvements in the first week. Also keep in mind the short-acting nature of Ritalin and Dexedrine. When you see your child in the evening, the effects may have worn off. The teacher may still see positive changes during the day. Make sure you look at all aspects of your child's day before you decide to stop the medication.

## **What to Tell Your Child?**

If medication is eventually prescribed, it is important to be honest with your child. Don't call it a vitamin or an allergy pill. Explain that the medication will make it easier to concentrate, complete his assignments, and get along with his friends. Your child needs to be told that medication will not solve all of his problems. It will not make him smarter—he is smart enough already. However, it will make it easier to pay attention to his teacher and schoolwork. A child can be told, "If you work very hard, you will probably finish your assignments and do better in school." The key idea is *hard work*.

Your child needs to be responsible for his own actions. Don't let him use forgotten or worn-off medication as an excuse for inappropriate actions or failure to complete homework. Also, refrain from making comments that link a child's undesirable behaviors to a need for medication. Avoid saying, "You're acting like you need another pill," or "You wouldn't have gotten in trouble today if you'd taken your medicine at lunch." The medication should not be seen as an all-controlling force outside the child. Medication can be beneficial, but the child must know that he is still in control of his actions. He alone is responsible for his academic and social accomplishments. On the other side of the coin, he is ultimately responsible for his mistakes.

The choice to use medication is important. The decision does not end when you start your child on a medication. Careful monitoring must be done to evaluate the effects and to determine the proper dosage. Side effects are possible, so careful observation of your child is necessary. Keep in contact with your physician.

Remember, medication is never the sole treatment program. What you do *after* start of medication is where the major benefits accrue. The effects of medication alone are temporary. The effects of instruction and self-control will last a lifetime. Medication is one aspect of a balanced treatment.

## Other Medical Interventions

Any concurrent illnesses or conditions such as allergies should be treated as effectively as possible. Research has not validated concerns about food additives, sugar, or diet. While this lack of evidence may be true for groups of children, there still may be a relationship with your particular child. I would encourage you to follow standard medical, nutritional, and psychological practice that has been demonstrated to be valid. If you wish to explore other forms of intervention, be cautious and be careful with your money. Examine the basis of the claims made for a particular treatment. Does it have only anecdotal support? Has it been submitted to scientific scrutiny? Has any professional organization taken a stand one way or the other on the particular idea you are considering?

Some health food devotees and nutritionists advocate massive ingestion of certain vitamins for a variety of problems. To the best of our knowledge, there is no evidence to support the efficacy of this for the treatment of ADHD. What studies do exist tend to support the idea that megavitamins are ineffective in reducing the symptoms of ADHD children. Of significant concern is the possibility of toxic blood levels from too high a level of vitamin intake. The supposed advantage of vitamin therapy over drug therapy, in being less toxic, thus becomes somewhat questionable. Too much of anything can be dangerous.<sup>16</sup>

Numerous studies have shown that caffeine, whether in coffee or in a tablet, has no measurable positive impact on the inattention of an ADHD youngster. About the only thing you can count on is that your child will have to go to the bathroom more often. This can add to his avoidance behavior, since he will now spend much of the morning running to the lavatory.

A book by Keith Connors, *Feeding the Brain: How Foods Affect Children*, presents a balanced and fair review of the effects of diet, vitamins, additives, and environmental toxins on children's behavior and functioning. It is a good resource if you wish to follow this topic in more detail. Another book by John Taylor, *Helping Your Hyperactive Child*, presents a supportive view of the Feingold diet as one of several options for treating ADHD children. He reports no real data to substantiate his positive convictions about the Feingold program, but does provide guidelines for utilizing the program.<sup>17</sup>

Pay attention to your child's response to various environmental influences. You can develop a good sense of how different environmental factors influence your son or daughter. Remember to alter only one thing at a time. If you can see definite agents that cause your child's behavior to fluctuate, bring these to the attention of the appropriate professional. Don't give up. Some nontraditional approaches could have potential. However, don't commit yourself until there is evidence for trying a specific idea.

A scientific study should have most of the following characteristics or components.

1. A placebo versus actual therapy trial where one group of children receives the actual treatment and another group receives treatment that appears to be similar, but omits the specific intervention being studied.
2. A random assignment of subjects to each of the groups.
3. Double-blind methods in which no member of the study knows who is actually being treated and who is not.
4. A standard evaluation procedure where each child is followed for a specific length of time, with recognized measurement tools, so effects and side effects of treatment can be monitored.
5. The use of appropriate statistical analysis, in which each study is analyzed with careful accounting methods to determine the actual success rate.

## **Conclusion**

The success of treatment for a person with ADHD depends on a cooperative effort between the child and a committed team of parents, caretakers, and professionals. Medication can be a significant component for treatment. However, one of its major contributions may be to provide an opportunity for the multimodal treatment program to be of maximum effectiveness. Medication may help improve the benefit of other interventions. Remember, that most of the time, taken alone, medication is not enough. It is the *skills* of self-control, not the *pills* that make the difference.

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