# Combining Stimulants With Monoamine Oxidase Inhibitors: A Review of Uses and One Possible Additional Indication

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***Background:*** Among antidepressant augmentation strategies, the addition of a stimulant to a monoamine oxidase inhibitor (MAOI) has received little attention in the literature in recent years because of the diminished clinical use of the latter and concerns of precipitating a hypertensive crisis or other serious complication. Despite that fact, experienced clinicians continue to use this combination for a variety of indications after other options have failed. This article reviews these reported uses and presents a case suggesting another possible indication.

***Method:*** A MEDLINE search was conducted for articles published from 1962 to December 2003 using relevant search terms (*psychostimulant, stimulant, amphetamine, dextroamphetamine, pemoline or methylphenidate, atomoxetine, bupropion, monoamine oxidase inhibitor,* and *selegiline).* A manual search was conducted of cross-references and other relevant recent psychiatric sources (2000–2003).

***Results:*** The described uses of the MAOI-stimulant combination have included treatment of refractory depression and the MAOI-related side effects of orthostatic hypotension and daytime sedation. No documented reports were found in the recent literature of hypertensive crises or fatalities occurring when the stimulant was cautiously added to the MAOI. Also presented here is another possible indication for this therapeutic regimen: treatment of attention-deficit/hyperactivity disorder in an adult patient whose major depression had uniquely responded to the MAOI tranylcypromine.

***Conclusion:*** As in other fields of medicine, potentially hazardous medication combinations are utilized in psychiatry after cautiously weighing the danger of the treatment against the morbidity and risk of not adequately addressing the illness. Particularly, as the potential arrival of the apparently safer transdermal selegiline may increase the use of MAOIs, we feel this combination deserves additional controlled study.

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The clinical value in thoughtfully combining psychotropic agents in order to maximize therapeutic benefits or address problematic side effects is well established.[1,2] While the augmentation of antidepressant pharmacotherapy has frequently been described,[3,4] one particular antidepressant regimen, that of adding stimulants to monoamine oxidase inhibitors (MAOIs), has received little discussion in the research literature in recent years. This lack is most likely related to 2 factors. First, there has been a diminished overall use of MAOIs as monotherapy in depression because of the concern of precipitating a hypertensive crisis, the necessary dietary limitations, their side effect profile, and the general preference for the newer, safer, and more tolerable antidepressant drugs such as selective serotonin reuptake inhibitors (SSRIs).[5] Second, there is a clearly stated contraindication in the Physicians' Desk Reference[6] to the MAOI-stimulant combination due to the fear of generating a potentially dangerous hypertensive reaction stemming from case reports of severe complications and fatalities attributed to this regimen.[7–11] However, it is evident from recent textbooks, presentations, and reviews, as well as Internet-based psychopharmacology discussion lists, that experienced clinicians have continued to utilize this regimen for a number of indications, primarily when other treatment regimens have failed. Additionally, there is the potential that a new MAOI delivery system, transdermal selegiline, not requiring the previous MAOI dietary restrictions,[12] will be released in the near future. With the possibility that there will soon be increased use of MAOIs, this report reviews previously described indications for the MAOI-stimulant combination and offers an additional possible clinical use based on a case from this clinician's practice.

## METHOD

A literature search was performed by means of MEDLINE (1962–December 2003). The search terms used were *psychostimulant, stimulant, amphetamine, dextroamphetamine, pemoline or methylphenidate, atomoxetine, bupropion, monoamine oxidase inhibitor,* and *selegiline.* A manual search was also undertaken of references cited in the identified articles, relevant psychopharmacologic textbooks, and psychiatric journals frequently

  

distributed to American clinicians over the last 4 years (2000–2003).

## RESULTS

### Treatment-Resistant Depression

The potential role for combining stimulants with MAOIs is perhaps most clearly described in addressing highly resistant depression. Feighner et al.[13] reported on a retrospective case series of 13 depressed patients, who were treatment-resistant for at least a 2-year period. As measured by the Clinical Global Impressions scale (CGI), 54% were judged to be much improved with the addition of a stimulant (dextroamphetamine or methylphenidate) to an MAOI, either with or without concurrent tricyclic antidepressant (TCA) administration. In that case series, no hypertensive crises developed, but orthostatic hypotension occurred in approximately one third of patients. These authors also noted occasional unspecified "elevated blood pressure" in their overall experience using this combination.[13]

Fawcett et al.[14] describe the role of adding a stimulant (dextroamphetamine started at 5 mg/day and increased up to 40 mg/day, or pemoline initiated at 18.75 mg/day and increased up to 112.5 mg/day) to an MAOI in a case series of 32 patients refractory to many antidepressant regimens, including electroconvulsive therapy (in 14 cases). While many of their patients were receiving other psychotropic agents including TCAs, mood stabilizers, and benzodiazepines, 78% were judged by the CGI to be responders over a 6-month period, although only 31% maintained that improvement. Elevated blood pressure related to this combination was reported in only 1 patient. However, switching to hypomania or mania was noted in 6 patients, 3 of whom were formerly felt to be suffering from unipolar illness.

The final case noted in the literature reports a 28-year-old depressed male patient whose illness was refractory to multiple antidepressant and psychotropic drug regimens.[15] He responded to tranylcypromine only after the addition of dextroamphetamine, increased up to 5 mg b.i.d. This response was lost when dextroamphetamine was withdrawn and was subsequently regained when dextroamphetamine was reinstituted.

In addition, experienced psychopharmacologists have included the stimulant-MAOI regimen in their textbooks or presentations as a potentially useful therapeutic option for refractory depression.[16–20] For example, Fawcett and Busch[18] describe that "in some patients with high risk depression for whom other treatments have failed, the use of stimulants to potentiate MAOIs has proved helpful and even lifesaving."[(p312)]

### Hypotension

Orthostatic hypotension is one of the most common and potentially serious side effects of MAOIs.[21,22] Some patients do accommodate to this side effect, which often develops within the first few weeks of treatment, but the discomfort and symptoms such as ataxia and dizziness, as well as the associated danger of falling, may necessitate treatment, particularly if the hypotension is severe or persistent. However, orthostatic hypotension may prove refractory to usually suggested remedies including dosage adjustment, the use of elastic support stockings, hydration, the addition of dietary salt or salt tablets, a mineralocorticoid (fludrocortisone), small amounts of caffeine, triiodothyronine ($T_3$), or, more recently, the alpha$_1$-agonist, midodrine.

Multiple clinicians[13,20,22–24] have described the cautious slow addition of either methylphenidate or an amphetamine to the MAOI to help a patient tolerate a full MAOI trial. For example, Feighner et al.[13] noted in relation to MAOI-induced orthostatic hypotension that "blood pressure often normalizes with the addition of a direct stimulant."[(p208)] Schatzberg et al.[20] described the use by clinicians of stimulants for this indication, but added "we have also heard of occasional hypertensive crises." [(p127)]

Interestingly, in recently reported trials with transdermal selegiline,[25,26] the incidence of orthostatic hypotension did not differ from that found with placebo. While further trials and clinical use are necessary to confirm that transdermal selegiline, unlike orally administered MAOIs, does not induce orthostatic hypotension, this finding suggests that when prescribing this new MAOI delivery system the addition of a stimulant may no longer be required to treat this problematic side effect.

### Sedation

While sedation has been noted with the more frequently prescribed SSRIs,[20] clinicians experienced with MAOIs are familiar with patients' descriptions of an intense afternoon somnolence, often with abrupt onset, and associated at times with nighttime insomnia.[27] A variety of therapeutic maneuvers have been anecdotally reported, in varying degrees, to be helpful in alleviating this annoying side effect. These include decreasing the MAOI dose, switching to another MAOI, changing the timing of the dosing regimen, adding small amounts of caffeine, and, more recently, using modafinil.[24] Parallel to the use of stimulants for the treatment of sedation and fatigue due to SSRIs,[28] clinicians have reported the successful use of stimulants for MAOI-related somnolence.[20,24] Small doses of dextroamphetamine or methylphenidate have been added, without reported hypertensive crises, either in the morning or early afternoon or at both times to ameliorate this side effect.[24]

### Attention-Deficit/Hyperactivity Disorder

The appreciation of the continuation of attention-deficit/hyperactivity disorder (ADHD) into adulthood with its associated morbidity and dysfunction has led to

greater aggressiveness in treating this disorder throughout the life cycle.[29] Most research agrees that there is a significant rate of comorbidity of major depressive disorder and ADHD.[30] A given patient suffering with these 2 disorders would require treatment of both. I am not aware of previous reports describing the concurrent use of stimulants with MAOIs for the treatment of these 2 purposes. Such a case is presented here.

***Case report.*** Mr. A, a 38-year-old white married man, had a lengthy history of DSM-IV–defined major depression. Following a long period of stability on fluoxetine at 20 mg/day, he presented due to breakthrough symptoms, occurring over a 2-month period, that included depressed mood, mild anhedonia, and increased negativity. Increasing the dose of fluoxetine to 40 mg/day was successful in alleviating these symptoms, although the patient described chronic difficulties completing needed tasks at work and home in a timely manner. Although clearly of superior intelligence, he was unable to move above a limited middle management–level job. Supportive and cognitive techniques were used in an attempt to address these issues but appeared to be of limited value.

Two years after Mr. A's initial presentation, he relapsed with a significant constellation of depressed symptoms, including tearfulness, an increased sense of worthlessness and hopelessness, anhedonia (e.g., an inability to enjoy leisure activities and time with his children), a clear decrement in work functioning beyond his usual difficulties at work, and increasing suicidal ideation. This episode proved unresponsive to further increases in fluoxetine dose as well as augmentation with mirtazapine. Related to an earlier negative experience with tricyclic antidepressants, Mr. A preferred not to attempt another such trial. Following a 38-day washout of fluoxetine and a 14-day washout of mirtazapine,[20,31] treatment with tranylcypromine was initiated and subsequently increased to 50 mg/day. At this dose, Mr. A reported clear improvement in depressive symptoms and returned to his premorbid level of functioning. However, what became even more evident were his difficulty prioritizing and following through on tasks, underachievement at work, and chronic low self-esteem. For example, he would often have to work into the evening to compensate for his inefficiency, noting as well that he worked best when stimulated by a crisis. Additionally, Mr. A and his wife described his longstanding and continued inability to follow through on necessary family-related tasks despite his stated desire to do so.

At approximately this time, Mr. A's 9-year-old son was diagnosed with ADHD and placed on methylphenidate (Concerta), which resulted in what the patient described as a "dramatic" positive change in his son's school and home functioning. This improvement led to a more comprehensive review of Mr. A's own early history, including collecting information from his elderly father, which was notable for childhood attentional problems that were apparently compensated for by his above-average intelligence. The strong possibility emerged that Mr. A's continued problems were, in part, related to long-standing but previously undiagnosed DSM-IV–defined ADHD symptoms. At that point, the various therapeutic options were discussed. Mr. A received a complete and unremarkable medical workup. He participated in a full discussion of the risks and benefits of adding methylphenidate to his regimen, as well as a review of the signs and symptoms of a hypertensive crisis.

After 8 months on tranylcypromine monotherapy, the slow addition of methylphenidate was begun at 2.5 mg per day, with 2.5-mg incremental increases every 5 to 7 days. At a dose of 45 mg/day, divided into 3 doses, Mr. A described a significant increase in his capacity to stay focused on necessary tasks as well as a clear decrease in his previously lifelong procrastination. He noted he was finishing work earlier and functioning more effectively on his job even when not in "crisis mode." He felt these changes were qualitatively different than any previous antidepressant response. No side effects were reported, although Mr. A did positively report that an early evening period of tiredness he had been experiencing while taking tranylcypromine no longer existed. Periodic blood pressure readings did not change significantly from baseline (systolic range, 105–120 mm Hg; diastolic range, 65–75 mm Hg). These positive effects have now persisted for 6 months.

Although there are reports of the therapeutic benefits of MAOIs in the treatment of ADHD symptoms,[32,33] as this vignette illustrates, this is not always the case.[34] Among the available nonstimulant pharmacologic options for ADHD, the addition of a TCA to an MAOI carries its own reported risks and is not generally recommended.[17,20] To this author's knowledge, there are no reports in the literature on combining atomoxetine with MAOIs. While monotherapy with bupropion has been reported to be useful for adult ADHD symptoms,[35] there is only a single report suggesting that bupropion may be added safely to MAOIs, a case involving treatment-refractory depression.[36] Additionally, the therapeutic value of bupropion for treating ADHD is not always robust.[37] Thus, considering the risks and limitations connected to the use of other medication options, a judicious trial with a stimulant did not seem inappropriate in this patient's case.

One cannot rule out from this single case report the possibility that the additional positive clinical changes observed on adding methylphenidate to tranylcypromine actually reflected an augmentation of the latter's antidepressant activity, an effect reviewed above. That is, rather than this case reflecting the treatment of ADHD, the stimulant further improved a depressive and/or dysthymic disorder, which until that point was only partially respon-

  

sive to MAOI monotherapy. However, this explanation appears less likely for a number of reasons. Mr. A's acute depressive symptoms were similar in nature to previous depressive episodes. These depressive symptoms appeared to fully respond to tranylcypromine. In contrast, the more longstanding, apparently lifelong, difficulties with prioritization, organization, procrastination, and inability to stay with and complete work tasks would seem more consistent with ADHD than dysthymia. These latter difficulties responded minimally to tranylcypromine as well as previous antidepressant pharmacotherapy, but did improve significantly upon the addition of the methylphenidate. This assumption is further supported by his son's ADHD diagnosis and response to methylphenidate.

It is also important to note, due to the long half-lives of fluoxetine and its metabolite, norfluoxetine, that there is the need for at least a 5-week washout of this antidepressant prior to the initiation of MAOI pharmacotherapy to prevent a potentially fatal interaction.[20,31] A 2-week washout period appears adequate when switching to an MAOI from other antidepressants.

## DISCUSSION

Clearly, the use of the MAOI-stimulant combination, for whatever the indication, carries risk. Fatalities associated with hypertension crisis, severe hyperthermia, and intracranial hemorrhages were reported in the 1960s' literature when amphetamine was used to potentiate MAOIs for refractory depression and other clinical uses.[7–11] I am not aware of similar published cases since then, although the combination of MAOIs with the recreational use of amphetamine or one of its derivatives, 3,4-methylenedioxymethamphetamine (MDMA, "Ecstasy"), has been associated with serious reactions including hypertensive crisis and fatal serotonin syndrome.[38–40] These latter cases are distinguished from the type of clinical use being discussed in this review as they involve the uncontrolled, addictive use of stimulants and MDMA, a unique "designer drug" with potent effects on brain serotonin stores.[40] However, the possibility does exist that subsequent serious complications related to the clinical use of the MAOI-stimulant combination have occurred but have not been reported, which would seem to be reinforced by Schatzberg and colleagues'[20] statement concerning second-hand reports of hypertensive crises as noted above. However, as noted by Feighner et al.[13] in reviewing the earlier literature, many of the cases of severe toxic reactions are not comparable with more recent clinical use. For example, some of these patients received intravenous administration of methylamphetamine.[8,9]

In contrast to the reported risk, one has to weigh the significant morbidity and suicide risk associated with inadequately treated major depressive illness as well as the relapse risk if intolerable side effects lead to treatment noncompliance. One might question if the morbidity and dysfunction associated with ADHD warrant the risks associated with the MAOI-stimulant combination. Clearly, that decision needs to be made on a case-by-case basis, based on full disclosure to patient and family of potential dangers.

The use of more "dangerous" combinations is not unusual in other areas of medicine after a physician carefully weighs the risk/benefit regimen in a given clinical scenario. We suggest psychiatrists do likewise with the treatment of psychiatric illness. However, due to the potential hazard associated with the MAOI-stimulant combination, it is not recommended early in a pharmacotherapy algorithm, regardless of the indication.

Although transdermal selegiline minimally inhibits MAO-A in the gut[41] and does not appear to require dietary restrictions,[25,26] research to this point is not clear as to the extent of potential hazard in combining it with sympathomimetic agents such as stimulants. On the one hand, Houtsmuller et al.[42] recently found that the addition of up to 40 mg of intravenous cocaine to ongoing transdermal selegiline treatment, 20 mg/day, was well tolerated and, in fact, attenuated the cardiovascular effects of cocaine in a group of cocaine-dependent subjects. Similarly, Schindler et al.[43] safely administered intravenous methamphetamine to squirrel monkeys on a chronic intramuscular selegiline regimen, noting somewhat diminished cardiovascular effects of this stimulant when combined with the latter agent. In contrast, as noted by Jacob et al.,[44] oral selegiline may adversely interact with indirect-acting sympathomimetic agents even at low doses, where MAO-A inhibition would not be anticipated. Further controlled research and clinical experience are likely to clarify this issue.

In terms of the practical clinical use of adding stimulants to MAOIs, a common denominator reported by clinicians experienced with this combination is the necessity of a rather slow titration, starting with a low dose, of dextroamphetamine and methylphenidate at not greater than 2.5 and 5.0 mg/day, respectively. The final dose of MAOI has not appeared to be a factor in the tolerability of this combination.[14] From existing reports it is not clear, at this point, whether dextroamphetamine or methylphenidate is safer or more effective for any of the indications discussed above, and thus one cannot recommend one versus the other. As clinical use of this combination appears to involve solely adult patients, one cannot, at this time, consider this regimen for the treatment of adolescents or children.

In summary, as the stimulant-MAOI combination is obviously being utilized by experienced clinicians after other options have failed, this review and case report are presented in the hope that controlled research can be initiated to evaluate its actual safety, effectiveness, and place in treatment algorithms. Similarly, research with transdermal selegiline would be indicated, particularly as it offers the potential of greater safety and tolerability.

*Drug names:* amphetamine (Adderall, Dexedrine, and others), atomoxetine (Strattera), bupropion (Wellbutrin and others), dextroamphetamine (Dexedrine, Dextrostat, and others), fludrocortisone (Florinef and others), fluoxetine (Prozac and others), methylphenidate (Focalin, Metadate, and others), midodrine (Proamatine and others), mirtazapine (Remeron and others), modafinil (Provigil), pemoline (Cylert and others), selegiline (Eldepryl and others), tranylcypromine (Parnate).

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