

# Caffeine-Induced Psychosis

By Dawson W. Hedges, MD, Fu Lye Woon, MA, and Scott P. Hoopes, MD

## ABSTRACT

As a competitive adenosine antagonist, caffeine affects dopamine transmission and has been reported to worsen psychosis in people with schizophrenia and to cause psychosis in otherwise healthy people. We report of case of apparent chronic caffeine-induced psychosis characterized by delusions and paranoia in a 47-year-old man with high caffeine intake. The psychosis resolved within 7 weeks after lowering caffeine intake without use of antipsychotic medication. Clinicians might consider the possibility of caffeinism when evaluating chronic psychosis.

*CNS Spectr.* 2009;14(3):127-129

## INTRODUCTION

A competitive antagonist of adenosine receptors<sup>1</sup> affecting adenosine A<sub>1</sub> and A<sub>2A</sub> receptors<sup>2</sup> and, possibly, benzodiazepine receptors,<sup>3</sup> as well as an inhibitor of phosphodiesterase and catecholamine metabolism,<sup>4</sup> caffeine is readily available from a variety of sources and is widely used by all age groups.<sup>5</sup> Possibly the

## FOCUS POINTS

- Caffeine use can cause depression, anxiety, agitation, and aggression.
- Caffeine may cause psychosis that when chronic may mimic other psychiatric conditions.
- Caffeinism should be considered in the differential diagnosis of psychosis.

most widely used psychoactive drug worldwide,<sup>4,6</sup> caffeine use can cause physical dependence.<sup>7</sup> In addition to producing stimulant-like effects,<sup>8</sup> such as increasing alertness and reducing fatigue<sup>4</sup> and increasing motor activity,<sup>2</sup> caffeine can cause anxiety,<sup>9</sup> agitation, and even aggression.<sup>10</sup>

The lack of a caffeine-induced psychotic disorder in the *Diagnostic and Statistical Manual, Fourth Edition–Text Revision* in contrast to other substance-induced psychotic disorders, such as amphetamine,<sup>11</sup> suggests that it may not be generally accepted that caffeine use should be included in the differential diagnosis of chronic psychosis. Herein, we report a case of presumed caffeinism associated with chronic psychosis that suggests caffeinism might be part of the differential diagnosis of chronic psychosis.

Dr. Hedges is an assistant professor in the Department of Psychology and the Neuroscience Center at Brigham Young University in Provo, Utah. Mr. Woon is a doctoral student in clinical psychology in the Department of Psychology and the Neuroscience Center at Brigham Young University. Dr. Hoopes is an adjunct faculty member in the Department of Psychiatry at the University of Utah School of Medicine and in private practice in Boise, Idaho.

Faculty Disclosures: The authors do not have an affiliation with or financial interest in an organization that might pose a conflict of interest.

Submitted for publication: November 1, 2008; Accepted for publication: February 23, 2009.

Please direct all correspondence to: Dawson W. Hedges, MD, 1001 SWKT, Brigham Young University, Department of Psychology and the Neuroscience Center, Provo, UT 84602; Tel: 801-422-6357, Fax: 801-422-0602; E-mail: dawson\_hedges@byu.edu.

## CASE REPORT

A 47-year-old successful male farmer with no history of psychiatric hospitalization presented with a 7-year history of depression, diminished sleep to as little as 4 hours/night, poor energy, explosive anger, decreased concentration, decreased appetite, anhedonia, and feeling of worthlessness. Seven years before his first presentation, the patient had developed the conviction that people were plotting against him to drive him off of his farm and take his land. At least twice, when he had found dead livestock on his farm, the patient thought that it was part of the plot against him and would entertain no other possibilities. The patient interpreted tire tracks in the driveway as belonging to the car of individuals trying to take his land, even though other more plausible possibilities existed. According to the patient's wife, the subject interpreted many everyday occurrences as evidence of the plot. Convinced of a plot against him, he installed surveillance cameras in his house and on his farm but never caught anything that would support his conviction that as part of the plot people were coming onto his farm at night. He became so preoccupied with the alleged plot that he neglected the business of the farm and eventually declared bankruptcy as a result. His preoccupation with the plot also led him to neglect the upkeep of his home, and he had his children taken from him because of unsanitary living conditions.

In addition to psychosis, the patient reported life-long difficulty sustaining attention, excessive talking, disorganization, distraction, and forgetfulness. He denied other features of anxiety and psychosis. The patient reported drinking less than one case of beer annually. However, ~7 years before presentation, he had sharply increased his consumption of coffee from 10–12 cups/day to ~36 cups/day, a change in coffee consumption corroborated by his wife who made much of the coffee for him at home. There was no history of psychosis before the increase in coffee consumption, but after the increased consumption, the patient developed paranoia. At presentation, the patient reported drinking >1 gallon of coffee/day.

At presentation, he was taking paroxetine 40 mg/day, alprazolam 0.5 mg TID, clonazepam 1 mg/day, and propranolol 10 mg QID. Medical his-

tory was remarkable only for hypertension. The mental status examination showed poor hygiene, but the patient was alert, oriented, friendly, and cooperative. Thought content showed paranoia. No medication changes were made, but the treating physician urged the patient to discontinue caffeine use. At a 3-week follow-up, the patient said that he had reduced his caffeine intake by 50%. He was euthymic and much less paranoid. His hygiene was markedly improved. One month later, he had further reduced his coffee intake, had reduced his paroxetine to 20 mg/day, and was rarely using alprazolam. His mood continued to be euthymic and he was free from paranoia. Two months later, he was drinking only 1–2 cups of coffee/day, paroxetine had been tapered and stopped, and he reported feeling better than he had for years. There was no evidence of paranoia or other psychosis. The surveillance cameras that he had installed earlier reportedly fell into disuse. Since the resolution of the original paranoia, the patient has at times increased his intake of caffeine, with a subsequent return of the paranoia, which has, in each case, resolved with reduced coffee intake.

## DISCUSSION

While generally well tolerated, caffeine can be associated with a variety of adverse events,<sup>10</sup> including depression.<sup>4</sup> It is unknown whether the association between caffeine and depression is due to self-medication with caffeine to reduce depressive symptoms or a direct effect of caffeine from reduced mood.<sup>4</sup> Moreover, caffeine in toxic doses can cause psychosis in otherwise psychiatrically healthy people<sup>4</sup> and worsen psychosis in people with schizophrenia.<sup>12</sup> Caffeine has been hypothesized to be a factor in some cases of clozapine-refractory psychosis.<sup>13</sup> In the case reported herein, the patient reported an ~7-year history of depression and psychosis that started after a sharp increase in caffeine use. He had no history of psychiatric hospitalization to suggest a previous psychotic disorder and was using no other drugs associated with inducing psychosis, other than occasional alcohol use. While it is possible that the patient had an undiagnosed paranoid personality disorder, he had successfully operated his business, and his wife reported the onset of paranoia only after the increase of caffeine consumption. Notably,

with reduction of caffeine use with no changes in his prescribed medications, the patient's mood improved and his paranoia was diminished at a follow-up visit 3 weeks later, making a paranoid personality disorder seem unlikely. Thereafter, he remained free of psychosis and depression. After reducing his caffeine intake, the patient also began to decrease his alprazolam use. Considering the patient's report of a life-long history of problems sustaining attention, a tendency for distraction, disorganization, and forgetfulness suggestive of attention-deficit/hyperactivity disorder, it may have been that the patient's use of caffeine, at least in part, was a self-medication attempt to improve attention and organization.<sup>14</sup> Regardless, in this case, we postulate that excessive consumption of caffeine may have been causally related to the development of psychosis in that there is no evidence of psychosis antedating the heavy use of caffeine and because the patient's psychosis resolved after he lowered his caffeine intake without the use of antipsychotic medication.

Adenosine inhibits serotonin and dopamine release; as such, by antagonizing adenosine receptors, caffeine can increase dopaminergic effects.<sup>1,6</sup> Accordingly, a reasonable explanation for the psychosis observed in this case is that the psychosis was due to elevated brain levels of dopamine from caffeine-induced adenosine antagonism.<sup>4</sup> Because of caffeine's association with depression and anxiety, it is also possible that the patient's anxiety and depression were due to caffeinism, as well.

## CONCLUSION

In contrast to previous case reports that describe the acute occurrence of psychosis after heavy ingestion of caffeine,<sup>15,16</sup> the case we report showed evidence of chronic psychosis that had resulted in severe psychosocial impairment and could easily have been mistaken for other long-term psychotic illness. Notably, the patient's psy-

chosis resolved upon lowering caffeine intake, and no other features of schizophrenia or any other psychosis were present, sparing the patient from the potential adverse effects and cost of antipsychotic medication. Overall improvement in depression and anxiety also occurred when caffeine intake was lowered.

A single case report is not sufficient justification to recommend that chronic psychosis from caffeine consumption is common enough to be routinely inquired about in cases of chronic psychosis. However, based on the finding reported in this case, the relative ease of asking screening questions about caffeine use, and previous reports indicating that caffeine in high doses might cause psychosis,<sup>4</sup> we suggest that caffeinism might be considered part of the differential diagnosis of chronic psychosis. **CNS**

## REFERENCES

- Garrett BE, Griffiths RR. The role of dopamine in the behavioral effects of caffeine in animals and humans. *Pharmacol Biochem Behav.* 1997;57:533-541.
- Fisone G, Borgkvist A, Usiello A. Caffeine as a psychomotor stimulant: mechanism of action. *Cell Mol Life Sci.* 2004;61:857-872.
- Nehlig A, Daval JL, Debry G. Caffeine and the central nervous system: mechanisms of action, biochemical, metabolic and psychostimulant effects. *Brain Res Brain Res Rev.* 1992;17:139-170.
- Broderick P, Benjamin AB. Caffeine and psychiatric symptoms: a review. *J Okla State Med Assoc.* 2004;97:538-542.
- Nawrot P, Jordan S, Eastwood J, Rotstein J, Hugenholtz A, Feeley M. Effects of caffeine on human health. *Food Addit Contam.* 2003;20:1-30.
- Kruger A. Chronic psychiatric patients' use of caffeine: pharmacological effects and mechanisms. *Psychol Rep.* 1996;78(3 pt 1):915-923.
- Dews PB, O'Brien CP, Bergman J. Caffeine: behavioral effects of withdrawal and related issues. *Food Chem Toxicol.* 2002;40:1257-1261.
- Wesensten NJ, Belenky G, Kautz MA, Thorne DR, Reichardt RM, Balkin TJ. Maintaining alertness and performance during sleep deprivation: modafinil versus caffeine. *Psychopharmacology (Berl).* 2002;159:238-247.
- Scott WH Jr, Coyne KM, Johnson MM, Lausted CG, Sahota M, Johnson AT. Effects of caffeine on performance of low intensity tasks. *Percept Mot Skills.* 2002;94:521-532.
- Yudofsky SC, Silver JM, Hales RE. Pharmacologic management of aggression in the elderly. *J Clin Psychiatry.* 1990;51(suppl):22-28.
- Diagnostic and Statistical Manual of Mental Disorders.* 4th ed, text rev. Washington, DC: American Psychiatric Association; 2000.
- Lucas PB, Pickar D, Kelson J, Rapaport M, Pato C, Hommer D. Effects of the acute administration of caffeine in patients with schizophrenia. *Biol Psychiatry.* 1990;28:35-40.
- Dratcu L, Grandison A, McKay G, Bamidele A, Vasudevan V. Clozapine-resistant psychosis, smoking, and caffeine: managing the neglected effects of substances that our patients consume every day. *Am J Ther.* 2007;14:314-318.
- Paluska SA. Caffeine and exercise. *Curr Sports Med Rep.* 2003;2:213-219.
- Shaul PW, Farrell MK, Maloney MJ. Caffeine toxicity as a cause of acute psychosis in anorexia nervosa. *J Pediatr.* 1984;105:493-495.
- Shen WW, D'Souza TC. Cola-induced psychotic organic brain syndrome. A case report. *Rocky Mt Med J.* 1979;76:312-313.