CASE REPORT

Disulfiram reaction in an artist exposed to solvents

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Abstract

This case report describes an artist on treatment for alcoholism with disulfiram (Antabuse) who suffered chronic symptoms similar to those of a disulfiram alcohol reaction, which we attribute to his occupational exposure to products containing alcohol and other solvents. Symptoms abated with strict precautions to prevent exposure, although gradually returned over the course of months, causing him eventually to stop the medication. Medical practitioners should be aware of possible adverse interactions between occupational solvent exposures and disulfiram.

Key words Alcohol abuse; artist; disulfiram; solvents.

Introduction

Disulfiram (Antabuse) is widely used in the treatment of alcoholism [1]. It acts by inhibiting aldehyde dehydrogenase, the enzyme that metabolizes acetaldehyde, a product of the action of alcohol dehydrogenase on ethanol. Ethanol intake while on disulfiram results in accumulation of acetaldehyde, believed to contribute to the symptoms of nausea, fatigue, headache, facial flushing and palpitations that serve to discourage ethanol intake [1].

While pharmacotherapeutic references caution against exposure to alcohol in foodstuffs, medications and skin products while on disulfiram [1–5], few mention industrial solvents [4,5]. The literature on occupational risk to disulfiram users appears limited to a letter describing a case in a house painter and another in a user of mineral spirits in ceramics work [6]. The current case report describes a likely disulfiram reaction attributable to industrial solvents.

Case report

A 46-year-old artist came to the attention of an internist during an admission for acute relapse of his alcoholism. His pattern was one of prolonged abstinence interrupted by binge drinking. He gave a 2 year history of unexplained malaise which coincided with treatment with disulfiram 100 mg daily.

Past history included partial gastrectomy for peptic ulcer disease 13 years previously, requiring iron and vitamin B12 supplementation, and aortic valve disease diagnosed 3 years previously. He had been prescribed bisoprolol for palpitations and more recently quetiapine 100 mg for nocturnal sedation and lamotrigine 100 mg as a mood stabilizer.

Physical examination and serum biochemistry, including liver function, were unremarkable, except for a low serum testosterone, for which he was prescribed testosterone undecanoate 1000 mg monthly. Tests in the month prior to admission showed no detectable blood alcohol on two occasions and negative drug screens. An organic solvent screen found a slightly elevated urinary acetone concentration, indicating at least some solvent absorption.

On referral to our occupational medicine clinic, he reported a cyclical pattern of nausea on waking, palpitations, left-sided chest discomfort, paraesthesia on the left side of his head and upper limb fatiguability. He described himself as feeling ‘poisoned’ with a ‘permanent hangover’. Neither facial flushing nor skin changes were recalled. These cycles lasted ~1 week and were unpredictable. His appetite was relatively unaffected. He described his quality of life as ‘poor’ although notably during a break from work the previous summer he had felt better.

He appeared fully aware of the mechanism of disulfiram and reported discontinuation of disulfiram prior to binge relapses, of which there had been two in the past year and none in the previous year. He reported also stopping the use of deodorants because of possible alcohol content.

He worked as a self-employed artist, painting and fabricating fibreglass structures on commission. He worked 7 days a week, 12 h a day using a range of solvent containing materials, listed in Table 1. Inspection of his studio by one of the authors revealed a spacious work area with windows on two sides and a cramped storage room with a washbasin.
**Table 1. Representative solvent containing products used by artist prescribed disulfiram**

<table>
<thead>
<tr>
<th>Product</th>
<th>Relevant solvent components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylated spirits</td>
<td>Ethanol and methanol</td>
</tr>
<tr>
<td>Paint/ varnish removers</td>
<td>Methanol and dichloromethane</td>
</tr>
<tr>
<td>Lacquer spray paints</td>
<td>Toluene and xylene</td>
</tr>
<tr>
<td>Lacquer thinners</td>
<td>Methanol, acetone, toluene, xylene and isopropyl alcohol</td>
</tr>
<tr>
<td>Metal polish</td>
<td>Isopropyl alcohol</td>
</tr>
<tr>
<td>Spray glue</td>
<td>Acetone, hexane and cyclohexane</td>
</tr>
</tbody>
</table>

Materials containers were scattered throughout. He reported leaving windows open subject to weather and wearing a respirator while spray painting because of ‘fume’ build-up. He smoked up to 40 cigarettes daily, ate in the studio, but did not sleep there.

He was unable to take a break from exposure owing to deadlines but was advised on strict precautions regarding skin contact and inhalation, including use of disposable gloves, long sleeves, regular hand washing, avoidance of smoking in the studio, leaving the windows open and use of a cartridge respirator while spray painting.

Following an alcoholic relapse shortly after his referral, he returned 6 weeks later reporting that, despite having restarted disulfiram, all his symptoms had abated with the precautions and that he felt ‘better than he had in years’ which he described as ‘something of a miracle’. There had been one episode in which a bottle of thinners had splashed in his face, eliciting symptoms of nausea, flushing and malaise within 20 min and persisting for a few days.

At a 4 month review, he reported that he had discontinued disulfiram because of recurrence of his symptoms, notably fatigue, palpitations and hangover. All these symptoms abated once the disulfiram was stopped and remained so at 12 month review.

**Discussion**

Three possible explanations were considered for his symptom pattern—disulfiram toxicity, undeclared alcohol use and a reaction between disulfiram and occupational exposure. Disulfiram toxicity, which is dose related and may manifest as neurological, psychiatric, hepatic or dermatological disturbance, was unlikely at his low dose of 100 mg daily [1, 2]. It would also not explain the cyclical pattern of his symptoms. Undeclared alcohol use remains a possibility although the patient appeared fully cognizant of the action of disulfiram.

We believe that an interaction between disulfiram and occupational exposures is the most likely explanation. Supporting features are the cyclical nature of his symptoms, improvement while previously on holiday, dramatic improvement once strict exposure precautions were introduced and acute exacerbation when exposed to a spillage of thinners. The eventual return of his symptoms could be counted against this explanation; however, it is equally plausible that he was unable to sustain his precautionary regimen given work pressure.

His work environment suggested many exposure opportunities—skin absorption, inhalation and ingestion (via smoking). Ethanol is found in industrial cleaners, thinner mixtures, inks and paints. Methanol is a component of methylated spirits, paint stripper and lacquer thinners. Since methanol is metabolized to formaldehyde, inhibition of aldehyde dehydrogenase by disulfiram may result in the bioaccumulation of formaldehyde. Disulfiram also inhibits enzymes of the cytochrome P450 system [1, 7] involved in the metabolism of solvents such as toluene and xylene commonly found in lacquer thinners [8]. Inhibition of this enzyme system by disulfiram might have contributed further to symptoms via slowed solvent metabolism [7]. The net effect may have been a more complex inhibition reaction than that typically seen in the disulfiram ethanol reaction. Universal precautions are thus warranted in disulfiram users if solvent avoidance is not possible.

**Key points**

- This case supports caution in the use of disulfiram in conditions of occupational exposure to solvents, such caution should appear in all disulfiram information sources.
- Medical practitioners prescribing disulfiram or dealing with malaise in patients on disulfiram should take an occupational history for exposure to industrial solvents.
- Occupational physicians performing risk assessment involving workers exposed to alcohols or solvents should bear disulfiram use in mind and advise on necessary work precautions or even redeployment of the individual prescribed the medication.

**Conflicts of interest**

None declared.

**References**