

CASE REPORT



## Beating the urine drug test – a case report on niacin toxicity

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### ABSTRACT

Niacin is a form of vitamin B3 which is used for the medical treatment of hyperlipidemia and niacin deficiency. However, within the last few years, it is being advertised on the Internet as a quick way to detoxify the human body in an attempt to evade urine drug tests. This claim is without any medical or scientific evidence and as a result, many cases have been reported where young adults have ended up with niacin toxicity. In this case report, we discuss a rare presentation of niacin toxicity and the effects Internet has had on the healthcare being practised by both the physicians and the patients themselves.

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### KEYWORDS

Niacin; toxicity; internet; urine drug test; metabolic acidosis; hypoglycemia

## 1. Introduction

Niacin, a water-soluble vitamin, is used by physicians for treating dyslipidemias and pellagra (caused by niacin deficiency). These medical conditions are clear indications for niacin use as indicated by a variety of medical literature and data. However, due to niacin's easy availability, it is being used as a detoxification supplement by young individuals to confound various drug tests. The dose of niacin being used for this purpose is also variable leading to multiple incidents of overdose.

To our knowledge, 12 cases of niacin toxicity (discussed in Table 1.) have been reported so far in clinical literature where the individuals took niacin specifically to confound various drug tests.

In this report, we discuss a similar case of niacin use but with a different presentation.

## 2. Case description

A 28-year-old gentleman with no previous medical history presented to our Emergency department with complaints of vomiting, diarrhoea, facial flushing, myalgias and palpitations. He gave a history of using tetrahydrocannabinol (THC) on a weekly basis and had an upcoming pre-employment urine drug test. In order to pass the drug test, he had searched the Internet to quickly detoxify his body where he had found that niacin can be used for this purpose. Without discussing this information with any physician, he had ingested 5500 mg of extended-release niacin within 12 h after which he started experiencing the stated symptoms. On examination, the patient had a blood pressure of 95/60 and pulse of 110/min which resolved after getting 2 L of


IV fluids. His skin appeared flushed but the rest of the examination was unremarkable. Labs showed leucocytosis of 14,000/uL, glucose of 55 mg/dl, anion gap of >25 and bicarbonate of 13 mEq/L. Lactic acid was 10 mmol/L and urine was positive for ketones. He did not have any signs of liver failure but had mild transaminitis with AST 56 IU/L and ALT 48 IU/L. APTT was normal but prothrombin time was elevated to 20.9 s. Acetaminophen, salicylate and alcohol levels were negative. Surprisingly, his urine drug test was also negative for any drugs including cannabinoids. He was started on dextrose-saline infusion for hypoglycemia and transferred to ICU for monitoring.

By day 2, his symptoms improved while lactic acidosis and hypoglycemia resolved. On the other hand, liver enzymes and prothrombin time worsened although he continued to remain stable demonstrating no signs of liver failure or coagulopathy.

By day 3, he was asymptomatic and did not require any IV fluids. Meanwhile, prothrombin time and liver enzymes started to improve and thus he was downgraded to medical floor. Serial lab values are discussed in Table 2. Serum nicotinic acid and nicotinamide levels were done which showed nicotinic acid of <20 ng/ml and nicotinamide of 258 ng/ml thus confirming the diagnosis of niacin overdose. He made a full recovery and was discharged on the 4th day with advice to follow as an outpatient.

## 3. Discussion

Niacin, also known as Nicotinic acid or Vitamin B3, is a water-soluble vitamin which is FDA approved for the treatment of dyslipidemia and niacin deficiency.

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**Table 1.** Reported cases of niacin overdose in attempts to pass drug tests.

Source	Clinical features	Ingested dose	Outcome
Paopairochanakorn et al. [8].	Metabolic acidosis, hepatotoxicity	Not reported	Recovered
	Metabolic acidosis, hepatotoxicity, coagulopathy	Not reported	Recovered
Mittal et al. [9].	Diabetic ketoacidosis, hepatotoxicity, prolonged QT interval.	5.5 g in 36 h	Recovered
	Lactic acidosis, hypoglycemia, coagulopathy.	2.5 g in 48 h	Recovered
	Flushing	Not reported	Recovered
	Skin rash	Not reported	Recovered
Arcinegas-Rodriguez et al. [10].	Metabolic acidosis, hypoglycemia, myopathy.	13 g in 48 h	Recovered
Daul et al. [14].	Acute renal failure, haemolytic anaemia, thrombocytopenia.	22.5 g in 48 h	Recovered
Fox et al. [11]	Lactic acidosis, hepatotoxicity.	8.25 g in 48 h	Recovered
Ellsworth et al. [5].	Acute Liver Failure.	Not reported	Recovered
Sheila et al. [15]	Hepatotoxicity.	7.5 g in 48 h	Recovered
	Hepatotoxicity	500 mg twice daily	Recovered

**Table 2.** Serial laboratory findings of the patient.

Lab values	On admission	Day 2	Day 3	On discharge
Lactic acid (mmol/L)	10	1.1	Not done	Not done
AST (IU/L)	56	301	103	60
ALT (IU/L)	48	207	182	173
PT (seconds)	20.2	26.2	22.4	12.8

**Table 3.** Formulations and dosage of niacin.

Formulation	Initial dose	Maximum dose	OTC availability
Immediate release	250 mg once daily	6 g daily in 3 divided doses	Yes
Sustained release	250 mg once daily	750 mg once daily	Yes
Extended release	500 mg once daily	2 g once daily	No

Niacin works by inhibiting hepatic lipogenesis and triglycerides production [1].

Its daily recommended dietary intake is 14–16 mg/day in adults while the usual therapeutic dose depends on the formulation being used. It is available by prescription either as an immediate-release, sustained-release or extended-release formulation (Table 3). However, there are many over-the-counter (OTC) formulations of immediate-release and sustained-release niacin [2].

However, niacin is also present in various nutritional and herbal supplements which are not well regulated by FDA with many supplements having as much as 500 mg of niacin per tablet/capsule. In addition, it can be found in a variety of energy drinks. Some drinks are documented to have as much as 10 mg of niacin per 100 gm content. All these preparations, thus, make niacin readily available for unregulated and dangerous use.

This is particularly concerning in an era of advanced technology where unreliable medical information is readily available on Internet. This is supported by various studies and systemic reviews done in the recent years. Quality is a major issue in consumer health information available on World Wide Web as found in a systemic review [3]. Another study estimated that more than half of the

patients use Internet for advice on health issues without discussing it with their physicians [4]. This behaviour has been found more prevalent in younger adults.

Our patient reported to have ingested large doses of niacin in attempt to evade a urine marijuana test. This information was procured from the Internet where niacin has been proclaimed to be a ‘Miracle drug’ to help pass urine drug tests. Various illicit drugs such as cannabinoids and cocaine are stored in body fat and slowly released thus making them detectable in blood and urine for a long duration. Niacin is thought to increase body’s metabolism and inhibits fat production thus ‘flushing out’ drugs from the body. A single search on Google can lead one to various forums and blogs where this claim is being highly touted and openly supported. Another case review by Ellsworth et al. [5] reported over 6 million results of a Google search related to ‘Niacin’ and ‘Drug tests’.

However, nowhere in medical literature, is this claim supported nor is there any recommendation about a safe dose of niacin for such use. Therefore, cases have been reported where young adults have presented with a variety of niacin adverse effects ranging from mild to life threatening. In a study conducted by CDC in 2006 [6], the centre reported that almost 23% of callers with niacin exposure, took it in an attempt to alter a drug test or to ‘flush or cleanse’ their bodies. These calls were identified in five US states within 9-month duration. Most common adverse effects reported were tachycardia, flushing, skin rash and vomiting. Thirteen were referred for medical treatment and no deaths were reported.

Our patient presented with hypotension and lactic acidosis. This can be explained by volume depletion secondary to persistent vomiting. However, quite interestingly, niacin has been documented to cause acute hypotension primarily due to prostaglandin-induced systemic vasodilation. Bays et al. did a review on the BP-lowering effect of niacin which has been studied in various clinical trials in order to evaluate its role as an antihypertensive drug [7].

Wide anion gap metabolic acidosis secondary to niacin overdose is an uncommon finding. A review of clinical literature showed ten case reports [8–13] of metabolic acidosis due to niacin overdose – intentional or unintentional – out of whom five patients were documented to have elevated lactic acid levels. In our patient, dehydration and hypotension could have contributed towards the lactic acidosis. Although niacin induced hepatotoxicity can lead to decreased clearance of lactic acid and subsequent lactic acidosis, our patient only had mildly elevated liver enzymes and prothrombin time with no signs of liver failure or coagulopathy.

Niacin is also documented to cause insulin resistance leading to hyperglycemia. However, our patient presented with hypoglycemia requiring IV dextrose infusion. This paradoxical finding can be explained by niacin's effect on lipid metabolism. Niacin causes hypoglycemia by inhibition of lipolysis and decreased production of free fatty acids which cannot be used as substrate for gluconeogenesis during prolonged fasting and starvation. Similar clinical scenarios were reported by Mittal et al. [9] and Arcinegas-Rodriguez et al. [10] when patients with no previous history of diabetes presented with hypoglycemia requiring temporary dextrose infusion.

Niacin overdose has been classically associated with flushing and hepatotoxicity but in recent years, we have seen various other cases of niacin toxicity such as hypoglycemia and lactic acidosis. These rare cases are likely to become more prevalent due to unregulated Internet-based health practices. As healthcare providers, we need to be more cautious while treating our patients.

#### 4. Conclusion

This case, while being a unique presentation of niacin toxicity also invites us to consider other significant aspects. First, this case is a perfect example of the extensive role Internet nowadays plays in self-practiced healthcare especially by young adult population due to its uninhibited use. Second, lack of FDA regulations on nutritional and herbal supplements is quite concerning.

As healthcare providers, we should be aware of the fact that our patients may be exposed to unreliable medical information leading to use of unrestricted drug paraphernalia resulting in increased incidence of various overdoses (such as niacin) with a myriad of clinical presentations. We should, therefore, maintain a high degree of suspicion and should strive to keep ourselves updated about recent Internet-based health

trends which are not scientifically proven but might be widely practiced by our patients.

#### Disclosure statement

No potential conflict of interest was reported by the authors.

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