


CASE REPORT

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Acute tea tree oil intoxication in a pet cockatiel (*Nymphicus hollandicus*): a case report

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Abstract

Background: Phytotherapy is becoming a more and more common practice, not only for personal care but also for pet care. Nevertheless, we often have to deal with substances on which, in most cases, very little literature is available, even more so if the species of interest are the exotic ones. In particular, the essential oil from the *Melaleuca* leaves, because of its anti-inflammatory and antibacterial properties, is widely used and very little is known about its potential toxicity on pet birds. The present paper describes the first case of Tea tree oil intoxication in a pet bird.

Case presentation: A one-year-old, 80 g male cockatiel (*Nymphicus hollandicus*) was presented for clinical examination due to a serious despondency episode after the application of 3 drops of tea tree oil (*Melaleuca alternifolia*) directly on the cutis of its right wing. The subject was urgently hospitalized and blood tests were performed. Serum biochemical values showed severe liver damage and slight renal involvement, complete blood count (CBC) parameters indicated a moderate neutrophilia a moderate neutropenia. Warm subcutaneous fluids and vitamin (VIT) B12 were administered, and after 8 h of fluid therapy the clinical condition of the patient improved. The subject was discharged after 48 h of hospitalization, in stable conditions.

Conclusions: Toxicosis are relatively common in bird pets and a number of cases are reported in literature, concerning heavy metals intoxications and toxic plants ingestion. However, in literature there are no described cases regarding *Melaleuca* oil intoxication in pet birds, but it has been reported in humans (mainly by ingestion) as well as in dogs, cats and rats. We hope that this first case report can be an initial aid in the knowledge of this potential toxicosis and therefore in the clinical veterinary practice of pet birds.

Keywords: Intoxication, Tea tree oil, Cockatiel, Pet bird

Background

Toxicoses are relatively common in bird pets. Indeed, a number of cases are reported in literature concerning both heavy metal intoxications and toxic plants ingestion [1–3]. Birds are smart and curious animals, therefore the accidental risk of toxic substances ingestion is relatively high. The body response to toxic agents is variable. It depends basically on size and weight of the subject, on the body nutrition status and on the amount of inhaled

or systemically absorbed toxins [3]. In pet birds, deadly Polytetrafluoroethylene (PTFE, Teflon™) fume intoxications are not uncommon. In general, clinical signs depend on various factors, for example, nature of the toxin, route of exposure, amount of toxin adsorbed and if the poisoning is acute or chronic [4]. *Melaleuca* is a genus of more than 200 species of endemic plants in Australia and Malaysia [5]. *Melaleuca alternifolia*, otherwise called “Tea tree” is an Australian species from the northern coast with a high content of terpinen-4-ol (more than 30% of gross weight) and low content of cineole (lower than 15%) [6]. The essential oil from the

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Melaleuca leaves, because of its anti-inflammatory and antibacterial properties, is widely used in the traditional medicine among the native Australian population to treat infections of the urinary tract, fingernails, skin, and acne [7]. Due to its components, such as terpinen-4-ol, α -terpineol, linalool, α -pinene, β -pinene, β -myrcene and 1,8-cineole, tea tree essential oil has demonstrated an high degree of antimicrobial effect against a wide range of bacteria (*Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus spp*, VRE-vancomycin resistant enterococci, *Acinetobacter baumannii*, *Escherichia coli*, *Klebisella pulmonae*), fungi (*Candida spp*, *Malassezia spp*) and protozoa (*Trichomonas vaginalis*) [6–9]. Tea tree has also been used in a spray form to control ticks (*Ixodes ricinus*) and poultry red mites (*Dermanyssus gallinae*) in poultry houses [9]. Terpenes are a class of organic compounds produced by a variety of plants [10] and animals, especially some insects [11]. The use of synthetic and natural terpenes in medicine is widely documented. Epidemiological studies suggest that dietary monoterpenes may be helpful in the prevention and therapy of cancers [12–15], fungal [16], bacterial [17], and parasitic diseases [18, 19]. Despite of the facts, literature about the use of this substances as therapeutics in veterinary medicine is still lacking [20]. There are some papers about the toxicity of Melaleuca alternifolia and its extract [21, 22], but only few reports about the toxicity of other terpenes and their metabolites.

Case presentation

A one-year-old, 80 g male cockatiel (*Nymphicus hollandicus*) was presented for clinical examination due to a serious depression episode lasted for about 4 h, which occurred after 3 drops (0,15 ml) of 100% pure tea tree oil (*Melaleuca alternifolia*) were applied directly on the cutis of its right wing (humeral region) and part of the

thorax. The parrot was properly managed: it was kept in a cage of about 80x40x50 cm, equipped with perches and water dispensers, and its diet was based on seeds, fruits and pellets. The owner reported that, before entering a comatose state, the parrot suffered convulsions and vomit that lasted about 15 min. The symptoms appeared 30 min after the essential oil was applied. Upon physical examination, the subject was comatose, it did not react to stimuli and was bradypneic (36 breaths/min) [23]. The affected area of the skin was hyperaemic. The subject was urgently hospitalized and placed under oxygen in a warm room at 28 °C (100% sat, 4 tl/min). A 2 projectional radiography (latero-lateral, LL, and dorsal-ventral, DV) was performed and revealed no sign of change in coelomic organs. A 0.8 ml venous sampling from the jugular vein was performed and then sent to the laboratory in order to evaluate the biochemical parameters, which showed severe liver damage and slight renal involvement, compared to references values reported in Table 1 [IDEXX Laboratories Italia S.r.l.; 23]. Moreover, the CBC parameters highlighted a slight heterophilia (84%) compared to reference values (40–70%) [24]. Warm subcutaneous fluids (Ringer solution) (50 ml/kg) [25] and VIT B12 (Dobetin 500 µg/ml injectable Via Amelia 70, 00181, Roma, Italia) (0.5 mg/kg IM [26]) were administered. After 8 h, the breathing normalized (65/min) [23] and the subject recovered its normal position. The state of consciousness was no longer comatose but only reduced and the patient started to eliminate faeces with a slightly diminished consistency and with bright green urates (Fig.1). After about 4 h, the bird started to spontaneously feed and was given hepatoprotector (Birdetox®, DRN srl, Via Bellisario, Cremona, Italia.) at the dosage of 1 ml/kg live weight orally and fluid therapy SC (2 ml ringer + Vit b12) once a day (SID). The subject was discharged after 48 h of hospitalization, in stable

Table 1 Comparison between biochemical values and CBC (Complete Blood Count) parameters of the patient (first blood sample, taken upon patient admission) and the reference values. The table shows as well the comparison between patient’s biochemical values at admission to that of post treatment (after the two-week therapy)

	Patient’s values at admission	Patient’s post treatment values	Reference Values
AST (Aspartate aminotransferase) (U/l)	742	328	100–350 ^a
Bile acids (µmol/l)	30.8	39.8	Colorimetric assay: 44–108 ^b
Total protein (g/l)	23	26	24–48 ^b
Albumin (g/l)	8	10	7.8–17.5 ^b
Creatine kinase (U/l)	4806	450	30–245 ^a
LDH (Lactic Acid Dehydrogenase) (U/l)	955	200	125–140 ^a
Phosphorous (mmol/l)	1.6	1.2	1–1.5 ^a
Calcium (mmol/l)	1.9	2.1	2.1–3.2 ^a
Potassium (mmol/l)	2.6	3.0	2.5 – 4.5 ^a

^a IDEXX Laboratories Italia S.r.l., ^b [23]

Hb Hemoglobin, MCV Mean corpuscular volume, MCH Mean corpuscular hemoglobin and MCHC Mean corpuscular hemoglobin concentration were not evaluated

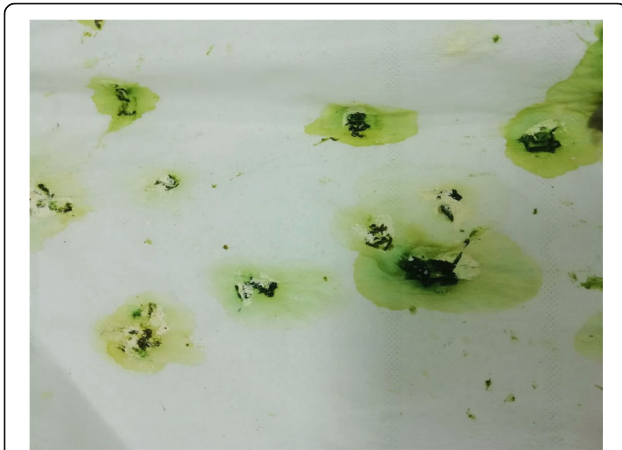


Fig. 1 Fecal appearance after 8 h hospitalization. The brilliant green colors of the biliverdin in the urates are a result of liver damage

condition. The therapy prescribed was only the aforesaid hepatoprotector at 1 ml/kg for at least 1-month therapy. A follow-up visit after a week was arranged, in order to repeat the relevant blood biochemical tests. The subject was re-examined after the two-week therapy. It was alert and its main organic functions worked properly. The faeces were normal in consistency and colour. A new blood sample was taken from the jugular vein, in order to re-examine biochemical and CBC parameters. Aspartate Aminotransferase (AST), Creatinikinas, Lactic Acid Dehydrogenase (LDH) compared to previous values, as shown in Table 1. The CBC was within the normal range [27].

Discussion and conclusions

With exotic animals it is not uncommon to encounter to encounter diseases due to wrong management, for example due to an improper diet [28, 29]. Phytotherapy is undoubtedly becoming a more and more common practice, not only for personal care but also for pet care. In herbalist shops, products derived from plants are often sold as safe and free of side effects. For this reason, pet owners sometimes improvise an initial treatment using these products, or turn to the vet asking if it is advisable to use an herbal product to treat their animals. Consequently, we often have to deal with many substances for which, in most cases, very little literature is available, even more so if the species of interest are the exotic ones. Essential tea tree oil is one of these: most products found on the market are not registered for use on pets, while some others are specifically marketed as products for pet hygiene and care (above all for dogs and cats). With respect to its toxicity the *Melaleuca* essential oil is similar to some other essential oils containing terpenes, such as eucalyptus

oil. Tea tree oil intoxication has been reported in humans (mainly by ingestion) as well as in dogs, cats and rats: the latter show signs of sense depression, weakness, obtundation, incoordination, ataxia and muscle tremors [21, 22, 30, 31]. Intoxication in cats entails an increase in the liver enzymes, thus highlighting the hepatotoxicity of *Melaleuca* oil. The increase in blood urea nitrogen (BUN) and dehydration, also in cats, does not exclude renal damage [22]. This could be due to mainly hepatic metabolism of terpenes and to the fact that they are mainly excreted through urines [31]. This case shows similar signs of intoxication, with severe liver damage and mild renal involvement, confirmed by the results of biochemical examinations. The toxicity of tea tree oil after oral intake is well documented in both experimental studies in rats (rats oral LD50: 1.9–2.6 ml/kg), and from cases of tea tree oil poisoning in humans [21, 32]. Toxicity following dermal application of high-doses of tea tree oil is reported in dogs and cats. For example, is documented the intoxication of three cats treated for flea with 120 ml of 100% pure TTO to their shaved skin [33]. The tree tea oil contains over 100 components and there is no information on the specific components responsible for the toxicity [21]. Although the rapid absorption through skin and digestive tract of tea tree oil is due to the highly lipophilic nature of the terpenes, no data are available about the absorption of each component when part of the mixture that constitutes the essential oil [21]. In our case is it possible that the toxic effects were due to both transdermal and gastrointestinal absorption, as the preening habits typical of parrots could have facilitated the ingestion of the essential oil. A definite diagnosis would be possible with the identification and quantification of terpenes in urates. Treatment in our case, included immediate supportive therapy through SC fluids and a proper source of heat. It was also worth checking the blood biochemical parameters after 2 weeks, to confirm recovery of organ functioning. In the literature numerous cases are reported in relation to pet bird toxicosis, due to heavy metals and toxic plants. In psittacines also Avocado (*Persea* spp.) intoxication has been reported [34, 35]. However, there are no described cases regarding *Melaleuca* oil intoxication in pet birds, while it has been reported in humans, dogs, cats and rats. The toxicology risk associated with herbal and natural remedies is not negligible. These types of products are uncontrolled, untested, unlicensed in spite of being very pharmacologically active. It is therefore important to inform veterinarians who can educate pet owners.

Abbreviations

AST: Aspartate aminotransferase; BUN: Blood urea nitrogen; CaEDTA: Calcium disodium ethylenediamine tetraacetate; CBC: Complete blood count; Cu: Copper; DV: *Dorsal-Ventral*; Hb: Hemoglobin; HCT: Hematocrit; IM: Intramuscular; LDH: Lactic Acid Dehydrogenase; LL: Latero-lateral; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; MCV: Mean corpuscular volume; Pb: Lead; PTFE: Polytetrafluoroethylene; RBC: Red blood cells; SC: Subcutaneous; SID: Once a day; VIT: Vitamin; WBC: White blood cells; Zn: Zinc

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Authors' contributions

AV was a major contributor in analyzing and interpreting the patient data regarding the hematological disease case management, and manuscript writing. MB was a major contributor in manuscript writing and literature review. IP contributed to the manuscript writing and revision. EM analyzed and interpreted the patient data regarding the hematological disease. CT, MDG, SC, SG, LS, KF, JC, EP did an accurate bibliographic research about toxic agents and their metabolites in birds. FDI contributed to case management and literature review. All authors read and approved the final manuscript.

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Availability of data and materials

All data generated or analyzed during this study are included in this published article [and its Additional file].

Ethics approval and consent to participate

The present case report has received ethical approval by the ethics committee of the University of Parma "Comitato Etico per la Sperimentazione Animale dell'Università di Parma", with the protocol number PROT.N. 16/CE/2019.

Consent for publication

Owners gave written consent for their pet's personal or clinical details along with any identifying images to be published in this study.

Competing interests

The authors declare that they have no competing interests.

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