THE KOLA NUT ("BISSY")

Information provided by Dr. Cecil Brownie

NOTE: "Bissy" is a local "home remedy" for "poisoning" of all types. There is no scientific evidence that it has any such properties. The fact that it contains theobromine, which can be TOXIC to dogs, suggests that its use in these animals can be HARMFUL.

Also called bissy nut, guru nut, (*Cola acuminate*, Cola nitida*, C. verticillata, C. anomala**)***

*Most readily available

** Frequently used in commerce

Fruit of the tree native to West Africa; naturalized in South and Central America, the West Indies, Sri Lanka and Malaysia

40 known species

Related to cocoa

Source of stimulant (People in **the US and Europe)**

Contains Caffeine and Theobromine – not Theophylline – (methylxanthine alkaloids) found in mate, tea, cocoa, coffee).

Used:

West Africa (chewing nuts – appetite and thirst suppressant; twigs – clean teeth and gums)

Strong cultural significance – valuable commodity; social lubricant by Islamic people (religion)

Manufacture of methylxanthine-based pharmaceuticals (Caffeine, theobromine and theophylline)

Mental and physical fatigue, supportive treatment for depressive states.

Effects:

Relax bronchial smooth muscles, stimulate CNS system, cardiac muscles, diuretic. Theophyllie – most active in asthmatics and is not present in cola nut

Caffeine in conjunction with other analgesics to produce stronger and quicker pain-killing actions.

Caffeine - Adverse side effects, 3-10 mg caffeine can be lethal

Non-pharmaceutical preparations – cola-based beverages

GRAS list of food additives (considered safe)

Endosperm freed from the testa of various Cola species (C. nitida in particular)

Preparation contains 1.5% methylxanthine (Caffeine and Theobromine)

Constituents:

Caffeine 1.5-2.5%, alkaloids (Xanthines), and Tannins (Catechins); betaine, cellulose, enzymes, fats, a glycoside, protein, red pigments and sugar.

Caffeine – CNS system stimulant, thymoleptic, anti-depressant, diuretic, anti-diarrheal effects.

Peripheral actions on heart, circulatory system, skeletal muscle, and autonomic functions.

Animal experiments – Analeptic and lipolytic activity, stimulates production of gastric acid and increased motility.

Humans – herb compared to methlxanthine, weaked diuretic and positive chronotropic

Contraindications: Gastric and duodenal ulcers

Side effects: Sleep disorders, over-exciteability, nervous restlessness, and gastric irritation

Pregnancy and lactation: No known restrictions

Interaction with other drugs: Strengthening action of psycho-analeptic drugs and caffeine-containing breverages.

Dosage/Administration:

2-6 g/day of powdered cotyledon and other galenical preparations (internal use)

1-3 grams Dried powdered cotyledon 2X to 3X daily

1-3 grams in 150 ml water 2X to 3X daily as decoction

Dry extract 0.25-0.75 grams

Fluidextract 2.5-7.5 ml

Tincture 10-30 ml

Cola wine 60-180 ml

Reference: Herbal Medicine Expanded Commission E Monograph. Blumenhal/agaoldberg/Brinckmann.2000 American Botanical Council

Seeds brought to JA in slave ship from Guinea around 1680

Medicinal properties (home remedy for many ailments) and antidote for poison, stimulant

Seeds grated and brewed

Several seeds inside hard wrinkled pod

Reference: A-Z oF Jamaican Heritage Olive Senior, Heinemann Educational Books (Caribbean) Ltd. and The Gleaner Company Ltd, 1983

Cola acuminate (Sterculiaceae) – Cola nut, bissy, Bissell

Activities – one or more phytochemicals (toxic)

> Carcinogenic, teratogenic, abortifacient, allergenic, co-carcinogenic, foetotoxic, mutagenic, neurotoxic, tumourigenic.

Ethnobotanical uses –

Belly; bowel- diarrhea, dysentery, constipation; diabetes; eye ailments (cataracts); fever; headache; poisoning; stomach-ache.

Reference: Jamaica's ethnomedicine; Eds. Lowe, Jackson, Sternberg, Duke Pelican publishers, 2001

Cola spp.

Activities – numerous (Analeptic, anorectic, antidepressant, bronchodilator, carcinogenic, , cardiotonic,, CNS stimulant, euphoriant, Digestive, diuretic, GI stimulant, poison, positive chronotropic, stimulant, thymoleptic, Tonic

Indications – Anorexia, atony, depression, inflammation, diarrhea, hunger, morning sickness, thirst, obesity, water retension, wounds,

Dosages – 1 – 2 teaspoons powdered seed/cup of water up to 3X daily.

1-3 grams powdered seeds; 2-6 grams seeds/day.

Contraindications/interactions/side effects:

High BP, gastric and duodenal ulcers; not in excess and prolonged use; restricted in pregnancy and lactation, hypertensive and cardiac patients;

insomnia, hyperexcitability, nervousness, enhanced psychoanaleptic drugs and caffeine containing beverages; CNS stimulant, GI irritant.

Reference: Handbook of Medicinal Herbs, James A Duke, CRC Press 2002.

Chocolate – Caffeine/Theobromine/Theophylline (methylated Xanthine alkaloids (methylxanthines)

Clinical signs – vomiting, diarrhea, PU/PD, ataxia, cardiac arrhythmias, CNS stimulation (seizures and hyperexcitability), and potential death.

Dogs – most frequently affected (indiscriminate eating habits (cocoa bean mulch, caffeine tablets, OTC caffeine tablets).

Caffeine: Mechanism (s) of action

Inhibits cellular phosphodiesterase causing an increase in Camp.

Stimulates release of catecholamines from adrenal medulla

Competitive inhibition of adenosine

Inhibition of calcium sequestration within the sarcoplasmic reticulum and an increase of calcium entry into cardiac and skeletal muscle cells

Pharmacokinetics/Absorption/Distribution/Metabolism/Excretion

Rapidly absorbed (peak plasma concentration within 30-60 minutes

Liver metabolism/biliary excretion

10% excreted unchanged via the kidney

Enterohepatic recirculation occurs

t ½ 4h (dogs)

Crosses Blood Brain Barriers and Placental Barriers/ absorbed in mammary gland

Theobromine – more slowly absorbed – peak plasma concentration in 10h

Liver metabolized and enterohepatic re-circulation

t ½ 17h dogs)

Methylxanthines – reabsorbed intact through bladderwall

Toxicity:

Caffeine - LD50 140 mg/kg (dogs); 80-150 mg/kg (cats)

Theobromine - LD50 250 – 500 mg/kg (dogs); 200 mg/kg (cats)

Clinical signs: – dose dependent

Chocolate products contain both together; cacao shell (used as mulch in horticultural practices)

Organ systems affected:

Cardiovascular (tachycardia, hypertension, other tachy-arrhythmias, bradycardia (rare)

Nervous (hyper-excitability, ataxia, general CNS excitability, generalized tonic-clonic convulsions (rare)

Gastrointestinal (vomiting, diarrhea)

Musculoskeletal (muscle tremors)

Renal/urologic (PU/PD, often reported by owners as urinary incontinence)

Respiratory (tachypnea, hypoxemia 2^0 to aspiration pneumonia, respiratory failure and cyanosis (high doses)

Endocrine/metabolic - hypokalemia)

Signalment - History:

Affects any age group or breeds (dogs)

Similar clinical presentation in cats (infrequently reported ie. discriminate eating habits)

Reported in other species (pigs, calves, chickens, ducks, horses, and bears).

Ingestion observed, product package wrap or access to cocao mulch (question owner at length)

Risk factors:

Slow metabolism of parent compound (caffeine, theobromine) due to existing liver problems

And/or existing cardiac disease leading to complications because of methyxanthine

Differential diagnosis:

Strychnine, nicotine, or amphetamine

Metaldehyde

Ingested medications (cardiac)

Serotonin syndrome

1^0 cardiac or CNS disease

Diagnosis:

Patient presented < 2h post exposure, physical examination findings may be normal

Symptomatic on presentation, mild hypokalemia might be evident, otherwise normal (CBC, serum chemistry, urinalysis) clinical pathology results.

Hematuria (+/-).

Methylxanthine levels within serum, plasma, tissue, urine or stomach contents – helpful. Levels remain stable for 7 days at room temperature, 14 days refrigerated, or 4 months if frozen.

Lesions consistent with gastroenteritis in addition to postmortem congestion (liver, kidney, spleen, thymus) are helpful.

Treatment:

Similar treatment goals for both caffeine and Theobromine – decontamination, prevent further absorption, promotes excretion of absorbed toxic components, and supportive – symptomatic care to at risk organ systems (cardiac and neurologic).

Decontamination:

Induce emesis if presented within 6h post exposure

Activated charcoal helpful since methylxanthines undergo enterohepatic re-circulation. Repeat activated charcoal treatment for up to 36-72h post ingestion making sure patient is monitored for hydration and if appropriate, treat as needed ie. risk of hyperthermia.. Important to include sorbitol (cathartic) with intial dose of activated charcoal.

Frequent voiding of urine prevents resorption of methylxanthine across bladder wall.

Supportive – symptomatic care:

IV fluid treatment (prevents dehydration, promotes excretion of methylxanthines, prevent electrolyte imbalances).

Diazepam 0.5-2.0 mg/kg IV to alleviate seizures, muscle tremors and hyperactivity.

Continuous cardiac monitoring essential. Treat tachy-arrhythmias (heart rate > 180 bpm – dogs), or hypertension (systolic pressure >200 mm Hg) with beta-blocker (metoprolol 0.20 – 0.4 mg/kg PO every 12h or propranolol starting dose 0.02 - 0.06 mg/kg IV every 6h)

Persistent bradycardia – administer atropine at 0.02 – 0.04 mg/kg IV, IM, or SQ.

No known antidote for methyxanthine (Caffeine and/or Theobromine) toxicity.

Reference: Small Animal Toxicology, EDs Osweiler, Hovda, Brutlag and Lee; Wiley-Blackwell, 2011.