INTRODUCTION

Ethylene glycol (EG) intoxication is one of the most common causes of acute kidney injury (AKI) and the second most common intoxication encountered in pet animals. Antifreeze is the main source of exposure, but ethylene glycol is also used in a variety of household products including cleaning products, varnishes, cosmetics and aromatic extracts. Ethylene glycol as such is not directly nephrotoxic; its metabolites (glycolaldehydes, glycolic acid, glycolat and oxalic acid) are the cause of renal damage. Ethylene glycol intoxication is more common in dogs than in cats, as they are more tempted by the sweet taste. Cats, on the other hand, are more frequently intoxicated through cutaneous absorption and grooming and have a lower minimum lethal dose of just 1.5 ml/kg with a recorded mortality after ingestion of EG of 96–100%. Ethylene glycol is rapidly absorbed from the gastrointestinal tract. The peak plasma concentration occurs about 1 hour after ingestion and approximately 50% of the ingested ethylene glycol dose is eliminated unchanged by the kidneys; however, a series of oxidative reactions in the liver and kidney metabolize the rest of ethylene glycol. The first step of the metabolism is its conversion to glycoaldehyde by alcohol dehydrogenase. Further glycoaldehyde is then metabolised to glycolic acid. The metabolites of glycolic acid turn to glyoxylic acid and then oxalate. The resulting toxic metabolites cause severe metabolic acidosis and impairment of the renal tubular epithelium. One of the most toxic metabolites is...
oxalate, as it cannot be metabolized further and it is cytotoxic to the renal tubular epithelium and exacerbates metabolic acidosis. Glycolic acid and oxalate are considered to be the metabolites responsible for the acute tubular necrosis associated with ingestion of ethylene glycol. The oxalate combines with calcium to form a soluble complex that is eliminated by glomerular filtration. If the concentration of the glomerular filtrate increases and the pH decreases, calcium oxalate crystals can form in the lumen of the tubes \(^9,12\) (Fig.1).

**Clinical signs** of EG toxicosis occur in III stages.

**First stage** (30 min–12 hours postingestion) is defined mainly by neurological signs such as depression, ataxia, seizures, coma, or death. As a consequence of the direct irritating effect of ethylene glycol on the mucosa, gastrointestinal signs may also appear. Research has shown that these clinical signs are due to aldehyde metabolites, hyperosmolarity, and metabolic acidosis, and resemble those of alcohol ingestion. Treatment is more likely to be successful if it is initiated in this stage \(^7\).

**The second stage** occurs from 12 to 24 hours following ingestion and is determined by metabolic acidosis, CNS depression, miosis and the development of cardiopulmonary signs such as tachypnea or tachycardia \(^7\).

**The third and final stage** (24–72 hours postingestion of a lethal dose) is characterized by acute renal failure and associated clinical signs (anorexia, vomiting, and other signs of uremia).

The ultrasonographic image of kidney with oxalate nephrosis points out ultrasonographic changes that varies from mild to marked increased renal cortical echogenicity with varying degrees of intensity of the corticomedullary junction (‘halo’ sign) and is supportive of the presumptive diagnosis of ethylene glycol intoxication \(^2\).

**MATERIALS AND METHODS**

The clinical investigations, ultrasound examination and treatment methods described herein were performed in the Clinic of Medical Pathology, Faculty of Veterinary Medicine, Bucharest, on a 9 months-old intact male cat, presented in a precomatose state in our clinic. Haematological, biochemical and urine tests were conducted in the Laboratory Clinics, belonging to the Faculty of Veterinary Medicine.

The ultrasonographic examination was performed using the Esaote Pie Medical MyLab, in M and B-modes, with convex, micro-convex and linear probes with a frequency range of 5-18 MHz. Storing and analyzing the image obtained was performed with the computer using specific morphometry software.

The anamnesis indicated that it was an indoor-outdoor cat with no medical history which had been away for a few hours.

Clinically, it presented with inappetence and lethargy. The physical examination revealed a precomatose state with hypothermia (36.8°C), capillary refill time was within 2-3 seconds, cyanotic mucous membranes, heart rate – 136 min, respiratory rate – 32 min, dehydration, uremic halitosis, mydriasis and an absent pupillary light reflex.

Blood biochemistry revealed a blood urea nitrogen of 75 mg/dL and a creatinine of 11.8 mg/dL. Repeated blood glucose measurements revealed oscillations between hypo- and hyperglycemia despite therapeutical intervention.

The ultrasonographic examination showed nephromegaly, increased renal cortical echogenicity, being markedly more echogenic than the adjacent liver with sonolucency in the
The third and final stage

stages.

the lumen of the tubes 9,12 (Fig.1)

glomerular filtration. If the concentration of the
form a soluble complex that is eliminated by

glycol. The oxalate combines with calcium to

metabolites responsible for the acute tubular

it is cytotoxic to the renal tubular epithelium

oxalate, as it cannot be metabolized further and

injury. Treatment is more likely to be

signs are due to aldehyde

signs may also appear. Research has shown that

signs such as tachypnea or tachycardia 7.

The second stage

postingestion of a lethal dose) is characterized

Calcium oxalate

GLYCOLATE

OXALATE

ETHYLENE

GLYCOL

Alcohol dehydrogenase

resulted in the need to take action

intervention.

hyperglycemia despite therapeutical

revealed oscilations between hypo- and

nitrogen of 75 mg/dL and a creatinine of 11.8

Blood biochemistry revealed a blood urea

pupillary light reflex.

uremic halitosis, mydriasis and an absent

min, respiratory rate

precomatose state with hypothermia (36.8°C),

lethargy. The physical examination revealed a

outdoor cat with no medical history which had

performed with the computer using specific

Storing and analyzing the image obtained was

my-convex and linear probes with a

performed using the Esaote Pie Medical

Medicine.

The ultrasonographic examination was

Pathology, Faculty of Veterinary Medicine,

herein were performed in the Clinic of Medical

examination and treatment methods described

presented in a precomatose state in our clinic.

MATERIALS AND METHODS

Ultrasound examination offered valuable

information regarding renal ultrasonographic

appearances, which were strongly suggestive of

ethylene glycol intoxication with increased

renal cortical echogenicity and the presence of

a ‘halo’ sign (an echogenic line in the outer

zone of the renal medulla, paralleling the

corticomedullary junction, described also as the

renal medullary rim sign).

The detection of ethylene glycol in the body

can also be aided by the fact that many

antifreeze liquids contain fluorescein, which is

easily detectable in urine by Wood lamp

examination up to 6 h after ingestion1.

Therapy. The deciding factor in the treatment

of ethylene glycol intoxication is the

administration of the antidote as soon as

possible. The antidote of choice is ethanol,

which competes with the ethylene glycol at the

active site of the enzyme alcohol

dehydrogenase. Its affinity is higher than that of

ethylene glycol, which leads to the excretion of

ethylene glycol in an unchanged form. The

second antidote, 4-methylpyrazole

(fomepizole), has a similar mechanism of

action – with only minor adverse effects

compared to ethanol, but it is very expensive

and rarely quickly accessible in common

veterinary practice 6,13.

RESULTS AND DISCUSSIONS

The clinical diagnosis of ethylene glycol

poisoning can be challenging, taking into

account the fact that in this case, the actual

ingestion couldn’t have been noticed by the

owner due to the absence of the cat from home.

Clinical signs were not specific especially when

considering that the symptoms could have been

representative of a large number of toxic or

infectious agents and are variable depending on

the stage of intoxication7.

Ethylene glycol intoxication should be

suspected in cats with acute onset of signs, high

values of urea, creatinine, hypocalcaemia,

hyperglycaemia (50% of patients develop

hyperglicemia due to inhibition of glucose

metabolism, increased blood epinephrine or
cortisol, uraemia7), azotaemia or uraemia and

depression, metabolic acidosis and calcium

oxalate crystalluria13.

Fig. 2. Urine sediment: the presence of calcium

oxalate crystal (Courtesy of the Laboratory of

the Faculty of Veterinary Medicine).

The diagnosis of oxalate nephropathy

associated with ethylene glycol toxicosis as the

cause was supported by the history and further

corroborated by the analytical findings.

Based on the paraclinical evidence, we

suspected an intoxication with antifreeze such

as ethylene glycol. The cat was treated

specifically and rehydrated, but after 48 hours

its clinical state had worsened and the decision

was made to euthanise the cat.

CONCLUSIONS

Ethylene glycol ingestion is a common cause of

lethal intoxication particularly in cats, but

prompt diagnosis and treatment with ethanol

therapy can be life-saving. However, in many

cases the early signs may be missed, as they

can be vague and non-specific, which results in

a tardy presentation of the animal to the vet.
Diagnosis of EG toxicity in the clinical setting must be made based on clinical signs as well as history and clinicopathologic findings. The speed with which the correct diagnosis is made directly influences the prognosis as the antidote is salutary when administered within the first five hours after ingestion. Otherwise, due to the enzymatic change into metabolites, the administration of an antidote is useless.

REFERENCES
Caloni, F., Cortinovis, C., Rivolta, M., & Davanzo, F. (2012). Papers Animal poisoning in Italy: 10 years of epidemiological data from the Poison Control Centre of Milan.
Diagnosis of EG toxicity in the clinical setting must be made based on clinical signs as well as history and clinicopathologic findings. The speed with which the correct diagnosis is made directly influences the prognosis as the antidote is salutary when administered within the first five hours after ingestion. Otherwise, due to the enzymatic change into metabolites, the administration of an antidote is useless.

REFERENCES


Caloni, F., Cortinovis, C., Rivolta, M., & Davanzo, F. (2012). Papers Animal poisoning in Italy: 10 years of epidemiological data from the Poison Control Centre of Milan.


MEAT PRODUCTS - ARE THEY SAFE FOR GUARANTEE THE POPULATION HEALTH?

Lucian-Ionel ILIE
University of Agronomic Sciences and Veterinary Medicine Bucharest, No. 59, Blvd. Mărăşti, 011464, Bucharest 1, Romania, Phone: +4021.318.22.66, Fax: +4021.318.28.88
Corresponding author email: drlucianilie@yahoo.com

Abstract
Foodstuffs of animal origin continues to record increased demand among consumers, compared to vegetable products, because they are characterized by a high biological value which is given by the rich content of most essential amino acids (Tăpăloagă, 2014). The development of metabolic processes, where foods are involved, must be done with respect for certain values for parameters that influence consumer health. The study presents some of the ingredients involved in making meat preparations and their medical importance, the values of some parameters that characterize their quality and safety while assessing the degree of consumption of these assortments of animal food. Sometimes, food quality characteristics are omitted by consumers either knowingly (when the cost price is the one that is the prime), or because of the way the product is presented which most of the time does not reflect the true reality, but the appearance, the smell, the taste or the way of packaging make it unremitting. Although, the values for the parameters determined by us, have been within the normal limits set by current legislation, the age of consumers (especially children) is worrying and also their weight in the daily diet, the two may adversely affect the health of these consumers later.

Key words: cold meats, food quality and safety, medical diseases, population health.

INTRODUCTION
The cold meats (cold cuts) are meat products, usually in membranes, which is consumed without prior cooking and for the manufacture of which are used raw materials, represented by meat (cattle, swine, sheep, poultry), bacon and by-products, but also many auxiliary materials (Hubert, 2005). Among the auxiliary materials used, we are particularly interested in salt, nitrite, polyphosphates.

The increased consumption of salt, over daily requirements is associated with higher blood pressure and an increased risk of hypertension, but also with serious consequences of water retention, such as: heart failure, kidney disease and renal lithiasis, edema, stroke or osteoporosis (APC, 2017).

The sodium nitrite, used for antimicrobial properties, being bacteriostatic at a pH= 5-6 is associated with potentially carcinogenic substances, especially for the digestive tract (stomach), as a result of interaction with the proteins in the preserved food (ILSI, 2011).

Also, excessive fat consumption, especially saturated ones, is the main cause of an increased value of cholesterol at children and later for obesity and cardiovascular disease.

MATERIALS AND METHODS
A total of 30 samples, representing assortments of semi-smoked meat products, were collected and analyzed by sensorial and physical-chemical exams. Samples were collected from units with a specific profile in Romania (a selling meat and meat products unit) and were represented by pork salami, summer salami, "extra" salami, "Victoria" salami and two kinds of sausages, these assortments being the most commonly used for making sandwiches. To these samples, the values of some quality and food safety parameters have been appreciated, namely: water, salt, nitrates, fat and protein, along with sensorial properties.

RESULTS AND DISCUSSIONS
The sensorial exam has followed the appreciation of the exterior and on the section appearance, consistency, colour, smell and taste. The examination revealed normal characteristics for these samples. The pieces were whole, with clean surface, without impurities or mould islands, smooth membrane, continue, adherent to the composition, resistant to traction; under the membrane without air voids.