A retrospective case series of companion animals hospitalized for ethylene glycol poisoning at a Canadian veterinary teaching hospital

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Supplementary TABLES

Table S1. Signalment of canine and feline patients presented to a Canadian veterinary teaching hospital[a] for EG-based antifreeze intoxication (2008-2024, n=21).

Patient	Month and year of presentation	Age (years)	Sex	Breed	Exposure history	Time to presentation (hours since onset of clinical signs)	Outcome
Dog							
1	October 2024	0.67	M	French Bulldog	Observed licking AF	4	Discharged
2	February 2024	6	FS	German Shepherd X	Free-roaming, ingestion not directly witnessed	9	Euthanized
3	July 2023	1	MN	Boxer X	AF present in garage, ingestion not directly witnessed	>24	Euthanized
4	November 2020	0.15	M	Blue Heeler	Observed licking AF	7	Discharged
5	July 2018	0.4	FS	Boxer X	Observed drinking AF	6	Discharged
6	June 2015	2	FS	Rat Terrier	Free-roaming on farm, ingestion not directly witnessed	>4[b]	Euthanized
7	September 2013	0.33	M	Saint Bernard X	No direct evidence of ingestion	>24	Euthanized
8	March 2013	1	FS	Husky X	Observed chewing bottom of jug containing AF	18	Euthanized
9	July 2012	9	FS	Golden Retriever	Ingested ~1 cup AF	>2	Discharged
10	June 2012	1	M	Husky X	Ate several things in garage, "pet-friendly EG" possible[c]	>24	Euthanized
11	April 2012	7	FS	Rhodesian Ridgeback X	AF pool outside, ingestion not directly witnessed	>12	Euthanized
12	May 2011	0.5	M	Bulldog	No direct evidence of ingestion	24	Euthanized
13	January 2009	1	FS	Pomeranian X	Observed licking tray of used AF	>4	Discharged
14	November 2008	6	MN	Malamute X	No direct evidence of ingestion	2[b]	Euthanized
15	June 2008	1	MN	Labrador Retriever	Observed drinking from toilet containing AF	120	Euthanized
Cat							
1	June 2022	12	FS	DMH	Outside cat, ingestion not directly witnessed	>12	Euthanized
2	June 2022	10	FS	DMH	Outside cat, ingestion not directly witnessed	>2	Discharged[d]
3	June 2019	< 1[e]	F	DSH	Covered in suspected AF	24	Euthanized
4	June 2017	4	MN	DSH	Outdoor cat, ingestion not directly witnessed	>12	Euthanized

5	May 2016	8	FS	DSH	AF on floor covered in kitty litter, ingestion not directly witnessed	>24	Euthanized
6	May 2009	4	FS	DLH	No direct evidence of ingestion	>2	Euthanized

[a] Veterinary Medical Centre, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada

[b] Dogs 6 and 14 presented twice; times listed are initial presentation

[c] Direct quote from owner history

[d] Discharged against medical advice to be euthanized by family veterinarian

[e] Cat 3 had unknown birthdate but was noted as pediatric

Abbreviations: DMH – domestic medium hair; DSH – domestic short hair; DLH – domestic long hair; M – male; MN – male neutered; F – female; FS – female spayed; AF – antifreeze; EG – ethylene glycol.

Table S2. Clinical signs of dogs and cats presented to a Canadian veterinary teaching hospital[a] for EG-containing antifreeze intoxication (2008-2024).

	Dogs (*n*=15)	Cats (*n*=6)	Total (N=21)
Neurologic			
Altered mentation	11 (73%)	6 (100%)	17 (81%)
Ataxia	10 (67%)	0 (0%)	10 (48%)
Seizures	2 (13%)	1 (17%)	3 (14%)
Head tremor	1 (7%)	1 (17%)	2 (10%)
Prolapsed nictitating membrane	1 (7%)	1 (17%)	2 (10%)
Nystagmus	0 (0%)	2 (33%)	2 (10%)
Gastrointestinal			
Vomiting	13 (87%)	1 (17%)	14 (67%)
Anorexia	3 (20%)	2 (33%)	5 (24%)
Urinary			
Polyuria	3 (20%)	0 (0%)	3 (14%)
Anuria	2 (13%)	1 (17%)	3 (14%)

[a] Veterinary Medical Centre, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada

Table S3. Diagnostic findings from canine and feline patients presented to a Canadian veterinary teaching hospital[a] for EG intoxication (2008-2024, N=21).

	BUN (mg/dL)	pH	$PvCO_2$ (mmHg)	HCO_3^- (mmol/L)	BE (mmol/L)	iCa (mmol/L)	Lactate (mmol/L)	Glucose (mmol/L)	P (mmol/L)	tCa (mmol/L)	Urea (mmol/L)	Creatinine (mmol/L)	USG	Urine sediment	Ultrasound
Dog															
1	5-15	7.286	62	28.54	0.4	1.46	1.4	5.6	2.85	2.78	5.4	79	1.014[b]	Struvite	-
2	30-40	7.234	18	7.55	-16.6	0.74	-	7.6	-	-	-	-	-	-	No medullary rim sign[c]
3	50-80	7.200	24.0	9.4	-15.9	1.21	-	6.9	-	-	-	-	-	-	Bilateral hyperechoic renal cortices[c]
4	5-15	7.288	37.1	17.1	-8.3	1.50	9.70	5.7	2.58	3.11	3.5	42	1.025	CaOx	-
5	5-15	7.311	46.0	22.3	-3.5	1.38	2.52	5.1	2.31	2.54	3.7	60	1.006	-	-
6	30-40	7.316	28.8	14.4	-10	1.08	16.57	4.8	3.32	2.88	31.9	509	1.009	CaOx	Bilateral hyperechoic renal cortices, well defined hyperechoic medullary rim
7	30-40	7.249	29.0	13.0	-16.7	1.31	10.89	6.1	3.89	2.96	22.8	250	1.010	CaOx	-
8	30-40	7.248	30.8	12.9	-11.7	0.71	23.16	9.8	2.54	1.41	27.2	430	1.014	CaOx	-
9	5-15	-	-	-	-	-	-	-	1.24	2.44	4.4	98	1.013[b]	-	-
10	-	-	-	-	-	-	-	7.3	7.94	2.15	310.5	2607	-	-	-
11	30-40	7.319	26.5	13.1	-10.1	0.96	16.53	5.6	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	3.07	2.95	29	446	1.016	CaOx	Bilateral hyperechoic renal cortices, marked medullary rim signs
13	5-15	7.310	50.5	24.4	-1.9	1.36	2.04	5.1	1.86	2.81	6.4	81	1.030	Struvite	-
14	-	-	-	-	-	-	-	-	3.07	2.12	15.7	340	1.007	CaOx	-
15	50-80	7.336	38.4	20.3	-5.3	0.48	0.54	10.1	7.18	1.44	127.2	2374	1.012	Struvite	-
Cat															
1	50-80	6.972	21.0	4.9	-24.9	1.00	0.50	4.7	-	-	-	-	1.014	CaOx	-

2	50-80	7.176	27.0	10.0	-16.3	0.81	2.40	5.7	3.86	2.12	50	1006	1.013	CaOx	-
3	50-80	6.999	29.2	6.7	-23.2	0.76	12.20	8.4	-	-	-	-	-	-	-
4	50-80	7.157	35.3	12.1	-15.4	0.56	4.93	20.2	-	-	-	-	-	-	-
5	50-80	6.929	25.5	5.3	-26.1	1.12	1.48	5.4	-	-	-	-	-	-	-
6	-	7.212	36.5	14.6	-12.8	0.63	-	13.4	3.44	0.84	35.1	449	1.010	CaOx	-

[a] Veterinary Medical Centre, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada

[b] Urine sample taken after IV fluid therapy initiated

[c] AFAST finding noted by emergency clinician

Abbreviations: $PvCO_2$ – Partial pressure of carbon dioxide in venous blood; HCO_3^- - Calculated concentration of bicarbonate; BE – Base excess; iCa – Ionized calcium; P – Phosphorous; tCa – Total calcium; USG – Urine specific gravity; UA – Urinalysis; CaOx – Calcium oxalate (monohydrate or dihydrate) crystals.

Table S4. Treatments administered to patients presented to a Canadian veterinary teaching hospital[a] for EG-containing antifreeze intoxication (2007-2024).

	Dogs (*n*=15)	Cats (*n*=6)	Total (n=21)
No treatment	1 (7%)	3 (50%)	4 (19%)
Antidotal therapy			
4-methylpyrazole	8 (53%)	0 (0%)	8 (38%)
Ethanol CRI	2 (13%)	0 (0%)	2 (10%)
Decontamination			
Activated charcoal	4 (27%)	0 (0%)	4 (19%)
Emesis induction	1 (7%)	0 (0%)	1 (5%)
Symptomatic and supportive therapies			
Intravenous fluids	14 (93%)	3 (50%)	17 (81%)
Anti-emetic	6 (40%)	0 (0%)	6 (29%)
Diazepam	3 (20%)	1 (17%)	4 (19%)
Calcium gluconate	2 (13%)	2 (33%)	4 (19%)
Mannitol	2 (13%)	0 (0%)	2 (10%)
Phenobarbital	1 (7%)	0 (0%)	1 (5%)
Thiamine	1 (7%)	0 (0%)	1 (5%)
Diltiazem	1 (7%)	0 (0%)	1 (5%)
Phosphate binder[c]	1 (7%)	0 (0%)	1 (5%)

[a]Veterinary Medical Centre, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada

[b]Epakitin – Vetoquinol, 250 mg calcium carbonate and 200 mg chitosan

Abbreviations: CRI – continuous rate infusion

Table S5. Diagnostic progression of patients hospitalized for EG intoxication at a Canadian veterinary teaching hospital[a] (2007-2024, n=21).

Dog	Time since presentation (hrs)	pH	$PvCO_2$ (mmHg)	HCO_3^- (mmol/L)	BE (mmol/L)	iCa (mmol/L)	Lactate (mmol/L)	PCV (%)	TP (g/dL)	BUN (mg/dL)	Urea (mmol/L)	Creatinine (mmol/L)	USG
1	0.33	7.266	62	28.54	0.4	1.46	1.4	44	7.0	5-15	5.4	79	1.014[b]
	13	7.365	50	29.03	3.5	1.38	1.3	38	5.9	5-15	-	-	-
	24	7.379	42	24.97	0.3	1.34	1.2	-	-	-	-	-	-
	40	7.393	42	25.97	1.5	1.3	1.4	40	6.3	5-15	-	-	-
2	0.17	7.234	18	7.55	-16.6	0.74	-	50	8.3	30-40	-	-	-
	2.5	7.282	19	8.98	-14.7	1.03	-	-	-	-	-	-	-
4	1	7.288	37.1	17.1	-8.3	1	9.7	40	5.1	5-15	-	-	-
	9	-	-	-	-	-	-	-	-	-	3.5	42	-
	13	7.380	39.8	23.3	-1.2	1.43	2.65	-	-	-	-	-	1.025
	32	7.372	43.8	43.8	-0.5	1.42	1.1	-	-	-	2.9	42	-
5	1.5	7.311	46.0	22.3	-3.5	1.38	2.52	46	6.8	5-15	-	-	-
	5	7.394	41.6	24.7	-0.1	1.38	1.31	39	5.9	5-15	-	-	-
6	1	-	-	-	-	-	-	-	-	-	5.7	-	1.011
	29[c]	7.295	25.9	14.4	-10.0	1.08	16.57	46	7.0	30-40	-	-	1.009
	36[c]	7.385	30.8	14.1	-9.4	1.10	12.09	34	5.5	50-80	-	-	-
	49[c]	7.379	30.4	17.4	-6.5	1.04	5.62	-	-	-	31.9	509	1.010
	51[c]	7.367	36.1	20.2	-4.5	1.13	2.98	33	4.3	50-80	36.8	710	-
7	2.5	7.248	20.3	8.7	-16.7	1.48	10.89	33	5.3	30-40	-	-	-
	24	7.252	30.8	13	-12.5	1.38	8.74	30	5.8	50-80	22.8	250	1.010

8	0.08	7.248	30.8	12.9	-11.7	0.71	23.16	63	9.0	30-40	27.2	430	1.014
	4.5	7.334	34.0	17.5	-7.0	0.89	17.77	-	-	-	-	-	-
9	0.08	-	-	-	-	-	-	45	7.4	5-15	4.4	98	-
	7	7.413	31.5	19.5	-3.7	1.13	1.82	-	-	-	-	-	-
	20	7.421	37.0	23.4	-0.5	1.32	1.10	38	6.2	5-15	-	-	-
	31	-	-	-	-	-	-	35	5.8	5-15	-	-	-
	43	7.424	41.0	26.1	-1.8	1.29	0.58	33	5.5	5-15	3.0	71	-
13	0.25	7.310	50.5	24.4	-1.9	1.36	2.04	-	-	-	-	-	1.030
	10	7.402	43.8	26.3	1.7	1.30	-	-	-	-	-	-	-
	50[d]	-	-	-	-	-	-	-	-	-	5.5	70	-
15	0.33	7.336	38.4	20.3	-5.3	0.48	0.54	-	-	-	127.2	2374	1.010
	1	7.340	40.2	21.5	-4.4	0.41	0.69	-	-	-	-	-	-
	3.5	7.379	39.3	22.7	-2.2	0.51	0.52	-	-	-	-	-	-
	6	7.290	41.4	19.3	-6.7	0.64	0.27	-	-	-	-	-	-
	12	7.311	31.6	15.5	-9.2	0.65	0.36	-	-	-	-	-	-
	17	7.284	29.5	13.6	-11.5	0.76	-	-	-	-	121.2	1716	1.012
	21	7.233	36.1	14.8	-11.6	0.70	0.15	-	-	-	-	-	-
Cat													
2	1.5	7.176	27.0	10.0	-16.3	0.81	2.4	33	10.1	50-80	-	821	1.013
	7	7.242	24.0	10.4	-14.7	1.02	1.6	-	-	-	-	-	-
	17	7.280	29.0	13.5	-11.3	1.08	0.8	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	50.0	1006	-
	48	-	-	-	-	-	-	-	-	-	46.2	1054	-
5	0.5	6.929	25.5	5.3	-26.1	1.12	1.48	35	12.0	50-80	-	-	-

3	7.104	24.6	7.8	-20.6	0.91	1.01	-	-	-	-	-	-

[a] Veterinary Medical Centre, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada

[b] Fluid therapy initiated prior to measurement

[c] Hours since initial presentation (hospitalized on second presentation, 27.5 hours after initial presentation)

[d] 24 hours after discharge

Abbreviations: $PvCO_2$ – Partial pressure of carbon dioxide in venous blood; HCO^{3-} - Calculated concentration of bicarbonate; BE – Base excess; iCa – Ionized calcium; USG – Urine specific gravity.

Table S6. Necropsy results[a] of canine and feline patients with suspected EG intoxication.

	Gross pathology	Histopathology
Dog		
7	Red erosions of oral mucosa, necrosis of stomach mucosa, pale renal medulla near papillae.	Severe nephrosis with numerous polarizing crystals in tubules, necrosis of tubules in renal cortex and medulla, multifocal ulceration of oral mucosa, focal mineralization of gastric mucosa.
10	White foam in trachea and lungs, fluid in abdomen and thorax, pools of fluid within soft tissues around both kidneys.	Large number of pale-yellow translucent crystals in tubules mostly in renal cortex but also medulla, associated renal tubular epithelium is disrupted, focus of mononuclear cells in right ventricular wall, dilated lymphatic vessels in lung connective tissue, crystals in several small blood vessels in cerebral cortex.
14	Both kidneys slightly enlarged. Serosanguinous fluid in abdomen, thorax, and pericardium.	Renal tubules diffusely dilated, lined with necrotic or degenerating epithelial cells, and contain abundant translucent shiny crystal aggregates (calcium oxalates). Diffusely dilated Bowman's spaces filled with amorphous eosinophilic material. Alveoli diffusely distended and contained eosinophilic edematous fluid, alveolar capillaries filled with blood.
Cat		
4	Roughened and pale area on lateral surface of tongue. Both kidneys have large, contracted area that appears fibrotic.	Marked chronic inflammation of renal cortices, small numbers of intratubular crystals consistent with oxalate, focal necrosis of renal pelvis, bilateral focal necrosis of lingual epithelium.
5	No pathologic abnormalities on gross post-mortem.	Renal cortical and medullary tubules containing refractile crystalline material consistent with oxalate crystals, tubule epithelium diffusely flattened and evidence of degenerative change.

[a] Results specific to EG toxicosis included, other disease processes (such as intravertebral disk disease) and suspected post-mortem changes excluded