VETERINÆRDAGENE 2025

12.-14. mars, Trondheim Tema: Beredskap

DEN NORSKE VETERINÆRFORENING

Cholangiohepatitis and pancreatitis: a clinical approach

Maria Lyraki DVM MSc DipECVIM-CA MRCVS

EBVS and RCVS Recognised specialist in Small Animal Internal Medicine

ΠΛΑΚΕΝΤΙΑ

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A few words about me…

- Graduation
  - University of Thessaly, Greece
- Residency
  - Langford Vets University of Bristol
- Current job
  - Plakentia Veterinary Clinic, Athens, Greece

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A few words about me…

- Feline research collaboration for Cyprus FIP outbreak
  - Greece
  - Cyprus
  - Czech Republic
  - Scotland

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Cleo

- 5-year FN Siamese
- 5-day history of inappetence, lethargy, vomiting
- No previous history of illness
- Indoor/outdoor
- Fed commercial dry food
- Up to date with vaccines, worming treatment

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Cleo

- Underweight (BCS 3/9)
- 7% dehydrated
- Jaundiced mucous membranes
- Blood pressure (Doppler) 95mmHg
- Tachycardia
- Weak peripheral pulses

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Differentials for acute vomiting

Gastrointestinal	Extra-gastrointestinal
Foreign body	Pancreatitis
Dietary indiscretion	Hepatic disease
Drugs/Toxins	Peritonitis
Neoplasia	Uraemia
Feline eosinophilic sclerosing fibroplasia	Metabolic disease
Infectious (parasites, FIP, protozoan)	Hyperthyroidism
Chronic inflammatory enteropathy	Sepsis

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Differentials for jaundice

- Haematology
  - Reticulocytes
  - Blood smear
  - Slide agglutination
- Serum biochemistry
  - Hepatocellular disease
  - Cholestatic disease
  - Proteins
  - Renal parameters
  - Electrolytes

Pre-hepatic	Hepatic	Post-hepatic
Anaemia due to haemolysis	Cholangiohepatitis	Pancreatitis
	Hepatic lipidosis	Cholelithiasis
	Infectious (FIP, Toxoplasma)	Cholecystitis
	Neoplasia	Neoplasia
	Sepsis	Gallbladder/bile duct rupture
	Drugs/toxins	

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Blood work

Parameter	Patient Result	Reference Interval
Urea (mmol/L)	6.4	6.0–10.0
Creatinine (µmol/L)	84	44–175
Total protein (g/L)	86.4	77–91
Albumin (g/L)	33.9	24–35
Globulin (g/L)	30.0	21–51
Albumin/globulin ratio	0.94	0.4–1.3
ALT (U/L)	72	15–45
ALP (U/L)	21	15–60
Total bilirubin (µmol/L)	173.7	0–10
GGT (U/L)	11	0–2
Sodium (mmol/L)	153.1	140–157
Potassium (mmol/L)	3.93	4–5
Chloride (mmol/L)	115	115–130
Calcium (mmol/L)	2.69	2.2–2.5
Phosphate (mmol/L)	3.87	0.90–1.70
Glucose (mmol/L)	6.8	3.5–7.5

Parameter	Patient Result	Reference Interval
Haemoglobin (g/dL)	9.70	8.00–15.00
HCT (%)	28.5	25.00–45.00
RBC (x 10^6/µL)	6.03	5.50–10.00
MCV (fL)	47.2	40.0–55.0
MCH (pg)	16.1	12.5–17.0
MCHC (g/dL)	34.0	30.0–35.0
Platelets (x 10^9/L)	671	200–700
WBC (x 10^9/L)	6.60	4.90–19.0
Neutrophils (x 10^9/L)	4.86	2.40–12.5
Lymphocytes (x 10^9/L)	0.99	1.40–6.60
Monocytes (x 10^9/L)	0.66	0.10–0.70
Eosinophils (x 10^9/L)	0.07	0.10–1.60
Basophils (x 10^9/L)	0.00	0.00–0.10

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Blood work

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Urea (mmol/L)	6.0–10.0
Creatinine (µmol/L)	44–175
Total protein (g/L)	77–91
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Sodium (mmol/L)	140–157
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Calcium (mmol/L)	2.2–2.5
Phosphate (mmol/L)	0.90–1.70
Glucose (mmol/L)	3.5–7.5

- No anaemia identified
- Lymphopenia/eosinopenia
- Hypoalbuminaemia
- **Severe hyperbilirubinaemia**
- **Mild ALT, GGT increase**
- Hypokalaemia
- Hypocalcaemia
- Hyperglycaemia

Reference Interval
8.00–15.00
25.00–45.00
5.50–10.00
40.0–55.0
12.5–17.0
30.0–35.0
200–700
4.90–19.0
2.40–12.5
1.40–6.60
0.10–0.70
0.10–1.60
0.00–0.10

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Abdominal ultrasound

- Enlarged pancreas
- Hypoechoic pancreas
- Hyperechoic mesentery

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Further investigations

- Urinalysis
- Abdominal ultrasound
- FeLV / FIV
- fPLi
- Vitamin B12

Parameter	Patient Result
FIV (ELISA)	Negative
FeLV (ELISA)	Negative

Parameter	Patient Result	Reference Interval
fPLI (µg/L)	101.0	2.0–7.0
SNAP fPL test	Abnormal	

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Ultrasonography for pancreatitis

- The most useful diagnostic modality for cats
- Hyperechoic or mixed echoic pancreas
- Dilated common bile duct
- Enlarged pancreas
- Irregular pancreatic margins
- Pancreatic nodules: pancreatitis vs nodular hyperplasia vs malignancy

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Differentials for jaundice

Most likely:
1. Pancreatitis

Less likely but possible:
2. Cholangiohepatitis
3. Infectious cholangiohepatitis

Pre-hepatic	Hepatic	Post-hepatic
Anaemia due to haemolysis	Cholangiohepatitis (neutrophilic/lymphocytic)	Pancreatitis
	Hepatic lipidosis	Cholelithiasis
	Infectious (FIP, Toxoplasma)	Cholecystitis
	Neoplasia	Neoplasia
	Sepsis	Gallbladder/bile duct rupture
	Drugs/toxins	

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Treatment

- Correction of hypotension
  - 5ml/kg fluid BOLUS Hartmann's (x 2) WITHOUT KCL
- Dehydration correction = Hartmann's with KCL
  - Body weight x 7% dehydration / 100 = 4,4 x 7 / 100 = 300ml
  - Minus fluid boluses = 256 ml, correction over 24h = 256 / 24 = 10, 6ml /hr
  - Maintenance = 2ml/kg/hr = 8,8ml/hr
  - Total 19ml/hr for the first 24 h
  - Stop if tachypnoea or serous nasal discharge develops
- Respiratory rate monitoring for signs of fluid overload

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Treatment

- Antiemetic: maropitant 1mg/kg IV, SID
- Prokinetic: metoclopramide 1-2mg/kg/day CRI
- Painrelief: buprenorphine 20µg/kg IV,IM,Transmucosal TID
- Appetite stimulant: mirtazapine 2mg PO EOD
- Nutritional support (voluntarily or naso-oesophageal feeding tube)
  - Avoid force feeding!

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Outcome

- Clinical response within 48 hours
- Biochemical parameters normalized by day 14
- Acute Pancreatitis confirmed based on compatible ultrasonographic findings and treatment response
- Based on this, further investigations were not required in this instance

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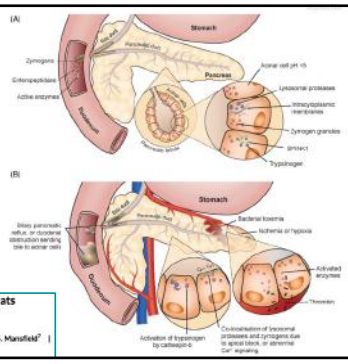
Pathogenesis



ACVIM consensus statement on pancreatitis in cats

Marnin A. Forman | Joerg M. Steiner | P. Jane Armstrong | Melinda S. Camus | Lorrie Gaschen | Steve L. Hill | Caroline S. Mansfield | Katja Steiger

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Differential diagnoses

- Cholangiohepatitis/triaditis
- Pancreatic cysts and pseudocysts
- Pancreatic nodular hyperplasia
- Pancreatic exocrine adenocarcinomas/adenoma

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A few considerations

- Acute pancreatitis is generally considered sterile and antibiotics are not recommended
- Broad spectrum antibiotics may be reserved for cases with suspected abscess or concurrent neutrophilic cholangitis
- Glucocorticoids have not been evaluated in cats with acute pancreatitis – they may be considered for concurrent chronic enteropathy, lymphocytic cholangitis
- Pleural effusion or pulmonary oedema have been reported with acute pancreatitis and close monitoring of the respiratory rate and effort is recommended

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A few considerations

- Cytology of the pancreas appears to be safe in the litterature but it is rarely needed
  - Cytology may reveal inflammatory cells but not always
  - In chronic pancreatitis, pancreatic cells do not exfoliate as easily
  - May be useful in cases of a pancreatic mass or abscess formation
- Histopathology - rare
  - if pancreatic neoplasia is suspected
  - Helps in differentiating acute from chronic pancreatitis - prognosis

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Hercules

- 8 y MN DSH
- 3-week history of inappetence
- Weight loss
- Lethargy
- No prior medical history
- Indoor/outdoor
- Fed a commercial diet
- Vaccinated, up to date with flea/worming

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Hercules

- Quiet
- Jaundiced
- Mildly dehydrated (5%)
- Lost 0.5 kg
- Good body condition score 5/9
- Blood pressure normal

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Differentials for jaundice

- Haematology
  - Reticulocytes
  - Blood smear
  - Slide agglutination
- Serum biochemistry
  - Hepatocellular disease
  - Cholestatic disease
  - Proteins
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	Sepsis	Gallbladder/bile duct rupture
	Drugs/toxins	

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Blood work

Parameter	Patient Result	Reference Interval
Haemoglobin (g/dL)	8.42	8.00–15.00
HCT (%)	30.9	25.00–65.00
RBC (× 10¹²/L)	6.26	5.50–10.00
MCV (fL)	47.8	40.0–55.0
MCH (pg)	15.0	12.5–17.0
MCHC (g/dL)	31.4	30.0–35.0
Platelets (× 10⁹/L)	85	200–700
WBC (× 10⁹/L)	4.57	4.90–19.0
Neutrophils (× 10⁹/L)	3.16	2.40–12.5
Lymphocytes (× 10⁹/L)	0.99	1.40–4.00
Monocytes (× 10⁹/L)	0.41	0.10–0.70
Eosinophils (× 10⁹/L)	0.00	0.10–1.60
Basophils (× 10⁹/L)	0.10	0.00–0.10

Smear examination revealed platelet clumps, machine count falsely low, platelet count

Parameter	Patient Result	Reference Interval
Urea (mmol/L)	5.0	6.5–10.5
Creatinine (µmol/L)	93	44–176
Total protein (g/L)	67.2	77–91
Albumin (g/L)	30.7	24–35
Globulin (g/L)	36.5	21–51
Albumin:globulin ratio	0.75	0.4–1.5
ALT (U/L)	530	15–45
ALP (U/L)	706	15–60
Total bilirubin (µmol/L)	84.1	0–10
Gamma GT (U/L)	3	0–7
Sodium (mmol/L)	152.0	145–155
Potassium (mmol/L)	4.75	4–5
Chloride (mmol/L)	116	115–130
Calcium (mmol/L)	2.45	2.3–2.5
Phosphate (mmol/L)	0.99	0.85–1.55
Glucose (mmol/L)	7.6	3.6–7.6

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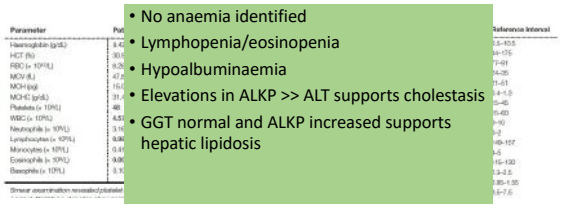
Blood work



- No anaemia identified
- Lymphopenia/eosinopenia
- Hypoalbuminaemia
- Elevations in ALKP >> ALT supports cholestasis
- GGT normal and ALKP increased supports hepatic lipidosis

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ALKP in cats

- ALKP is located on the hepatocyte membrane of bile canaliculi
- Cats posses various intestinal, bone, renal isoenzymes
- Cats lack corticosteroid-induced ALKP and therefore it should not be increased after steroid administration
- GGT is a superior marker of cholestasis in comparison to ALKP
- **ALKP increase in cats with normal GGT and compatible history supports hepatic lipidosis**

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Abdominal ultrasound

- Diffusely hyperechoic and enlarged liver
- Biliary tree was normal

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Further investigations

- **Urinalysis** - unremarkable
- **Abdominal ultrasound**
- **FeLV / FIV** - negative
- **fPLi** – normal
- **Vitamin B12 low** – indicative of ileal malabsorption
- **T4** – normal does not support hyperthyroidism
- **TLI** – normal, rules out exocrine pancreatic insufficiency

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Differential diagnoses

- Hepatic lipidosis primary or secondary
- Cholangiohepatitis/triaditis
- Hepatic Lymphoma
- Hepatic FIP
- Hepatic Toxoplasmosis

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Further investigations

- **Toxoplasma gondii IgG / IgM** in blood – negative
- **Ammonia** measurement - normal
- **Clotting times (PT / aPTT)** - normal
- **Buccal mucosal bleeding time** - normal

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What is next?

Liver cytology

- Risk of haemorrhage is lower
- A short sedation/ anaesthetic is only required
- There is no recovery time needed post-op
- Diagnostic for hepatic lipidosis
- Diagnostic for lymphoma

Liver histopathology

- Higher risk of haemorrhage
- Prolonged anaesthetic
- 2 weeks of wound healing post-op
- Necessary for diagnosis of cholangitis or neoplasia (other than lymphoma)
- Allows sampling of the intestines, lymph nodes, bile for Triaditis work up

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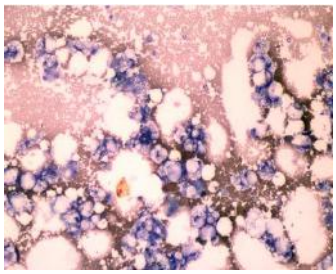
Liver cytology

- Marked vacuolar hepatopathy consistent with hepatic lipidosis



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Hepatic lipidosis

- Debilitated cats after a period of reduced calorie intake or secondary to concurrent diseases
- Catabolic state leads to increased mobilization of peripheral fat stores to the liver and reduced removal of lipid from the liver
- Excessive lipid accumulation in hepatocytes
- Severe liver dysfunction and death
- Can be idiopathic (particularly in overweight cats)
- Secondary to an underlying disease such as cholangiohepatitis, pancreatitis, diabetes mellitus, kidney disease, neoplasia

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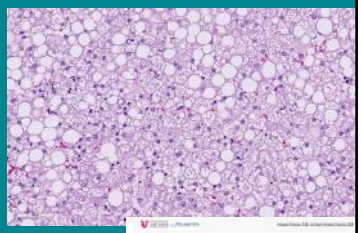
Feline hepatic lipidosis



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Main treatment considerations for hepatic lipidosis

1. Correct fluid and electrolyte abnormalities
2. Initiate enteral feeding as soon as possible (slowly at first to avoid re-feeding syndrome)
3. Anti-emetic therapy
4. Supplement B12 if low or low end of normal
5. Correct any coagulation disturbances with vitamin K and/or fresh frozen plasma
6. Consider additional nutrients
    1. Most evidence L – carnitine (250-500mg/cat SID)
    2. Taurine, arginine, thiamine, SAMe, vitamin E
7. Hepatic encephalopathy if applicable
    1. Lactulose 0,3-0,5 ml PO TID
    2. Amoxycillin 10-20mg/kg IV or PO TID

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The options for enteral feeding

- Syringe feeding should be avoided
- Tube feeding
    - Naso-oesophageal (temporary)
    - Oesophagostomy
    - Gastrostomy
- Balanced diet for cats in liquid form or tinned diet liquidized
- Restricted protein initially (if hepatic encephalopathy present)
- High protein long-term
- Multiple small meals or a CRI via syringe driver
- Day 1: 1/3 of the RER, Day 2: 2/3 RER, Day 3 full RER

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Outcome

- Hercules responded initially well to treatment and he was stabilized
- ALT progressively increased and anorexia continued after 10 days of hepatic lipidosis treatment
- Haematology showed progressive neutrophilia
- Exploratory laparotomy was decided for:
  - Liver biopsy
  - Cholecystocentesis for bile culture and cytology
  - Small intestinal biopsy
  - Oesophagostomy tube placement

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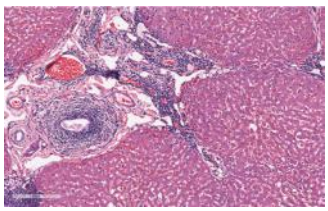
Liver histopathology

- Consistent with mixed neutrophilic and lymphocytic cholangitis
- Bile culture revealed E. coli
- Duodenal, Ileal and Jejunal biopsies all revealed lymphoplasmacytic enteritis



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Feline Cholangiohepatitis

- The WSAVA recognizes three forms of cholangitis in cats:
  - Neutrophilic
  - Lymphocytic
  - Chronic cholangitis associated with liver fluke
  - Combination of neutrophilic and lymphocytic may exist
- Neutrophilic cholangitis may be due to ascending bacterial infection
- Lymphocytic cholangitis may have an immune-mediated aetiology as well as an association with concurrent inflammatory bowel disease

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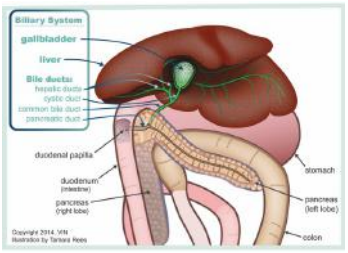
Pathogenesis



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Pathogenesis 4 models

Enteritis leads to dysbiosis and increased intestinal permeability. This leads to splanchnic bacteraemia and haematogenous seeding of bacteria in the liver and/or pancreas.

Reflux of duodenal contents into the pancreaticobiliary duct system could be the route by which enteric bacteria reach the liver and/or pancreas

Acute pancreatitis is the initial event. This, in turn, leads to acute enteritis and/or cholangitis possibly due to the close anatomical relationship between the three organs. The enteritis then potentially leads to bacterial translocation to the pancreas and/or liver

A combination of genetic and environmental factors in cats with IBD leads to a loss of immune tolerance to dietary components and/or the intestinal microbiota. The resulting enteritis is often associated with dysbiosis, and low-grade bacterial translocation could also occur. Activation of the innate/adaptive immune system then leads to immune-mediated injury in the pancreas and/or live

Excerpt From

Feline Gastroenterology

Fabio Procoli, Karin Allenspach & Silke Salavati Schmitz

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Treatment – neutrophilic cholangitis

- Antibiotics based on culture and sensitivity testing ideally
  - Amoxicillin / clavulanic acid 20mg/kg IV, PO TID
  - Treatment duration course 4-8 weeks depending on clinical response
- Ursodeoxycholic acid 10-15mg/kg PO SID
- Pain relief: buprenorphine 20µg/kg IV,IM,Transmucosal TID
- Symptomatic care as needed
- Nutrition via oesophageal feeding tube as required

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Treatment – lymphocytic cholangitis

- Prednisolone 1-2 mg/kg PO SID
- Ursodeoxycholic acid 10-15mg/kg PO SID
- Pain relief: buprenorphine 20µg/kg IV,IM,Transmucosal TID
- Symptomatic care as needed
- Nutrition via oesophageal feeding tube as required

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Treatment – lymphoplasmacytic enteritis

- Vitamin B12 supplementation
- Prednisolone as required for the lymphocytic cholangitis will benefit the enteropathy as well
- Hydrolyzed protein diet in the future once the appetite is good at home

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Outcome

- Good recovery
- Started eating after 7 days of treatment
- Gradual weaning off medications
- Long-term control with low dose cyclosporine and hydrolyzed protein diet

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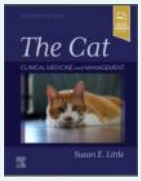
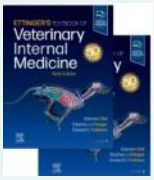
More information





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Thank you very much
for your attention!

Any questions?

marialyraki@outlook.com

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