Feline Infectious Peritonitis - some Hong Kong cases
Allan Kessell
VDL 27/6/18

Overview
• FCV, FECV, FIP
• Immunity
• “wet” vs “dry”
• Epidemiology
  - shelters
  - age
  - shedding

Diagnostics
History + signalment
- age, breed- pure bred- Birmans, Bengals, Abyssinians...
- “wet” vs “dry” : dry increasing in prevalence
- incubation : weeks to months
- failure to thrive, wt loss, abdominal distension
- pneumonia, pleuritic, hepatitis....
- CNS/eye in >20% dry forms
- most common cause of spinal disease in cats <2 years of age

Overview
History + signalment
Pathology : CBC/biochem
: fluid analysis
: Serology
: Electrophoresis

Gold Standards : effusion FCV PCR
: histopathology + IMHC : inflamed tissue
: immunocytochemistry – fluids, aspirates

Electrophoresis
- moderate to severe, broad-based gamma globulin peak compatible with a polyclonal gammopathy
- compatible with a chronic inflammatory process
- supportive of a diagnosis of FIP.
Case 1: 18-589

Classic

Thank you Mr Google

5mth female British Shorthair cat

13/2/18: arrived from UK, final vaccination

18/3/18: reported dull, not eating well last few weeks

Physical exam: pot bellyed, ascites

- FBC
- abdominal fluid

<table>
<thead>
<tr>
<th>In House</th>
<th>Result</th>
<th>Normal</th>
<th>Biochemistry</th>
<th>Result</th>
<th>Normal</th>
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<td>73</td>
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<td>Albunin</td>
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<td>Lymphs</td>
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<td>Globulins</td>
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<td>Lymph</td>
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<td>&lt;0.9</td>
<td>ALT</td>
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<td>Glucose</td>
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<td>4.1-8.3 mmol/l</td>
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Ab. Fluid Analysis

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<tr>
<td>Gross</td>
<td>Turbid, yellow clear</td>
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<td>RBCC</td>
<td>1.04</td>
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<tr>
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<td>2.66</td>
<td>&lt; 1.5 x 10^9/l</td>
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<tr>
<td>Total protein</td>
<td>62</td>
<td>&lt;20 g/l</td>
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Cyto: Neutrophils = 46%
Lymphocytes = 10%
Macrophages = 44%

Diagnosis: Modified Transudate- low level 
exudate

What next??

Case 2: 18-584

Classic, sort of

PCR feline coronavirus = +ve (very)
6 mth old British Short hair (again) male cat

Primary Veterinarian
- bred in Russia, arrived HK 10/1/18
- had diarrhea on arrival but bright, appetite OK
27/1/18 : developed pyrexia and ascites
- US = fluid in abdomen = 43 g/l: FIP strongly suspected
- PCR fluid coronavirus : -ve (not VDL)

Referred to another vet

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<th>In House</th>
<th>Result</th>
<th>Normal</th>
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<tr>
<td>MCV</td>
<td>37.3</td>
<td>37-55</td>
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<tr>
<td>Bands</td>
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<tr>
<td>Lymphs</td>
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<tr>
<td>Monos</td>
<td>0.17</td>
<td>&lt;0.9</td>
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<tr>
<td>Eosins</td>
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<tr>
<td>Platelets</td>
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<td>300-800 x 10^12/l</td>
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<table>
<thead>
<tr>
<th>Biochemistry</th>
<th>Result</th>
<th>Normal</th>
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<tr>
<td>Sodium</td>
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<td>Potassium</td>
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<tr>
<td>Chloride</td>
<td>115</td>
<td>115-123 mmol/l</td>
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<tr>
<td>Urea</td>
<td>6.0</td>
<td>5.4-10.7 mmol/l</td>
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<td>Creatinine</td>
<td>51</td>
<td>70-160 mmol/l</td>
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<td>Phosphate</td>
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<td>Total protein</td>
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<td>Albumin</td>
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<tr>
<td>Globulin</td>
<td>39</td>
<td>28-48 g/dl</td>
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<tr>
<td>ALP</td>
<td>&lt;10</td>
<td>5.80 U/I</td>
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<tr>
<td>Glucose</td>
<td>6.5</td>
<td>4.1-8.2 mmol/l</td>
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</tbody>
</table>

Exploratory laparotomy 6/2/18

Abdomen
- thick yellow fluid in abdomen
- white plaques on mesentery, peritoneum, surface of liver, MLN
- Lymphadenopathy
  ??looks like FIP

- Save biopsies in formalin
- 15/3/18 : contact CityU VDL- ???????

Histopath mesentery

<table>
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<tr>
<th>Dog and Cat</th>
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<tbody>
<tr>
<td>CBC</td>
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<td>clear</td>
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<tr>
<td>RCC</td>
<td>99</td>
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<tr>
<td>NCC</td>
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<tr>
<td>Total protein</td>
<td>43</td>
<td>&lt;20 g/l</td>
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</table>

Cytology:
- 57% neutrophils
- 24% lymphocytes
- 19% macrophages

Diagnosis: Modified transudate
Case 3: 18-1362
Classic complex dry

2yr British Shorthair (again) male castrated

Previous History during 2017
- chronic diarrhea/chronic cat flu 1 year
- picky eater
- July – negative feline diarrhea panel (+FCV)
- November: QBC PCV = 37%

16/11/17 Referral
Exam
- thin, NAD abdo/thorax
- serous ocular/nasal discharge
- L eye anterior chamber cloudy, iris discoloured (!!!!!!!!!!!!)
US: thickened colon, enlarged MLNs
Cytology: no suggestion neoplasia/inflammation
DDx: Lymphoma, IBD (?dry FIP)

27/12/17: ex. laparotomy
Pre-anaesthetic in house Results:
PCV = 34
TP = 103 g/l (57-89), globulins 78g/l (28-51), urea 3.8mmol/l (5.7-12.9)

Histopathology (not VDL):
- Liver: mild to moderate lymphoplasmacytic Cholangiohepatitis
- MLNs: reactive with histiocytosis
- Colon: mild to moderate diffuse lymphoplasmacytic cholitis
Dx: IBD – placed on pred

Subsequently: managed medically
- Diarrhoea lessened, would occasionally flair up
- Bouts of cat flu (adjust pred)
- Variable appetite, variable activity level
- L eye still affected (!!!!!!!!!!!!)

April, 2018: developed mild ataxia hindlegs

10/5/18
Exam
- continuing uveitis L eye, worsening ataxia
- gradual weight loss
Ultrasound
- Kidney capsules uneven
- L kidney enlarged, loss of cort-med definition
- R kidney mass at caudal pole
- small amount abdo fluid
Cytology (VDL):
- Kidneys: renal cells, occasional vacuolated macrophage
### Biochemistry Result Normal

- **Sodium**: 160 mmol/l (147-156 mmol/l)
- **Potassium**: 3.5 mmol/l (3.8-4.6 mmol/l)
- **Chloride**: 3.5 mmol/l (115-123 mmol/l)
- **Urea**: 8.5 mmol/l (5.4-10.7 mmol/l)
- **Creatinine**: 115 mmol/l (70-160 umol/l)
- **Cholesterol**: 2.54 mmol/l (1.9-3.9 mmol/l)
- **Phosphate**: 1.62 mmol/l (0.87-2.10 mmol/l)
- **Total protein**: 91 g/l (56-80 g/l)
- **Albumin**: 26 g/l (22-35 g/l)
- **Globulin**: 65 g/l (28-48 g/l)
- **Bilirubin**: 5 umol/l (2-10 umol/l)
- **ALP**: 25 U/l (5-80 U/l)
- **ALT**: 21 U/l (5-80 U/l)
- **Glucose**: 4.46 mmol/l (4.3 – 8.2 mmol/l)

### In House Result Normal

- **RCC**: 4.79 x 10^12/l (5-10 x 10^12/l)
- **Haemoglobin**: 64 g/l (80-150 g/l)
- **PCV**: 20 (24-40)
- **MCV**: 85 (30-65)
- **MCH**: 13.4 (15-17)
- **MCHC**: 320 (300-360 g/l)
- **WBC**: 3.51 x 10^9/l (5.5-19.5 x 10^9/l)
- **Neut**: 2.79 (2.5-12.5)
- **Bands**: ND (<0.4)
- **Lymph**: 0.43 (1-7)
- **Mono**: 0.29 (<0.9)
- **Eosin**: 0 (<1.6)
- **Platlets**: 113 x 10^12/l (300-800 x 10^12/l)

### 17/5/18: VDL

**Exam**: Neurological signs much worse
- non ambulatory, HL paresis, R head turn, nystagmus, UMN bladder

**US**: very small amount abdo fluid, rest as before

**In House Serum**:
- Total protein = 92, Globs = 66

### 17/5/18

**Exam**: Neurological signs much worse
- non ambulatory, HL paresis, R head turn, nystagmus, UMN bladder

**US**: very small amount abdo fluid, rest as before

**In House**:
- Total protein = 92, Globs = 66

### Subsequent

- **23/5/18**: Cryptococcus ag titre negative
  - Toxo PCR –ve
- **27/5/18**: cat passed away

**Case 4 : 18-1622 Unusual Form**

**History**: Sudden onset vomiting 1 week ago, esp. after eating

**Exam**: Bright, no diarrhea
- palpable mass caudal abdomen

**UltraS**: gross thickening/lost layering of mid caudal GIT, enlarged MLNs
**Biochemistry Result Normal**

<table>
<thead>
<tr>
<th>Sodium</th>
<th>154</th>
<th>147-156 mmol/l</th>
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<tbody>
<tr>
<td>Potassium</td>
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<td>Chloride</td>
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<tr>
<td>Creatinine</td>
<td>91</td>
<td>50-160 umol/l</td>
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<tr>
<td>Albumin</td>
<td>23</td>
<td>22-35 g/l</td>
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<tr>
<td>Globulin</td>
<td>62</td>
<td>28-48 g/l</td>
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<tr>
<td>Glucose</td>
<td>6.92</td>
<td>4.1 – 8.8 mmol/l</td>
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**Total protein** 15.6 g/l

**Albumin** 2.0 g/l

**Creatinine** 66 umol/l

**Glucose** 6.92 mmol/l

**In House: 3/6 Result Normal**

**Histopathology**

**Distal SI**

**MLN**

**FCV IMHC**

**4/6/18: exploratory Lap**

- MLNs: 3 cm in diameter
- adhesions

**DDX:** ? Neoplasia

**Histopathology**

**Distal SI**

**MLN**

**FCV IMHC**

+ve FCV IMHC = FIP
Post Surgery

- Owner informed of FIP diagnosis
- Owner sought second opinion - lost to follow up


Clinical signs: diarrhoea/vomiting < 3 mths duration
GIT lesion: localized lesion around ileocaecocolic junction or colon
- pyogranulomatous inflammation, +ve FCV IMHC

Outcome: Cats euthanased/died within 9 mths multystemic FIP signs

4 ½ mth old British Shorthair cat (again) male

16/5/18: Referral to clinic for dyspnea, fever

Radiographs: right sided soft tissue opacity
- appeared to have pockets and fibrous bands
Recommend CT and surgical exploration

Case 5: 18-1368
Odd case

Biochemistry

<table>
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<th>Normal</th>
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<td>RCC</td>
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<td>MCHC</td>
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<td>WBC</td>
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<td>Neut</td>
<td>4.02</td>
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<td>Bands</td>
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<td>Lymphs</td>
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<td>Monos</td>
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<td>Eosin</td>
<td>0.14</td>
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<tr>
<td>RBC</td>
<td>5.56</td>
<td>4.2–8.5 mmol/l</td>
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CT Scan/surgery

CT Report: moderate R sided pleural effusion – likely pyothorax
- sternal lymphadenopathy likely reactive
- normal abdomen

Surgery: thickened pleura and mediastinum, large volumes of fluid
- R lung lobes collapsed, friable, appeared necrotic

Lung tissue: forwarded for aerobic/anaerobic culture
- histopathology
subsequently

• Bacterial culture : negative
• FCV PCR thoracic fluid : +ve
• Doing poorly

Bottom Line

• Classic vs non classic
• Age variation, breeds
• Wet vs dry
• Supportive tests (Clin Path) vs gold standard tests
  - Histopathology + IMHC
  - FCV PCR on effusions (not blood or faeces)
  - Cytology + IMCC (working on it)
### Results: FCV stability study

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<th>Ct</th>
<th>Days</th>
<th>Temperature</th>
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<td>Day 0</td>
<td>35.34</td>
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<td>Day 1</td>
<td>35.2</td>
<td>1.67E+01</td>
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<tr>
<td>Day 4</td>
<td>34.69</td>
<td>2.35E+01</td>
<td>4deg</td>
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<tr>
<td>Day 7</td>
<td>35.67</td>
<td>1.23E+02</td>
<td>4deg</td>
</tr>
<tr>
<td>Day 15</td>
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<tr>
<td>Day 15</td>
<td>35.77</td>
<td>1.15E+01</td>
<td>RT (25deg)</td>
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</table>

**FCoV (Quantity, copies/rxn)**

- FCoV was detected in all the time points and conditions.
- No significant decrease in FCoV in 15 days under 3 storage conditions.
- Ct difference < ±1 (reference to Day 0)

---

**Legend:**

- FCoV: Feline Coronavirus
- Days: Day 0, Day 1, Day 4, Day 7, Day 15
- Temperature: Day 1 (4deg), Day 4 (4deg), Day 7 (4deg), Day 15 (4deg), Day 1 (RT), Day 4 (RT), Day 7 (RT), Day 15 (RT)
- Ct: Copies per reaction