Avian Campylobacteriosis (Avian Vibrionic Hepatitis) (AVH) (Avian Infectious Hepatitis) (AIH)

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Definition

It is an infectious bacterial disease of young and adult birds characterized by diarrhea, loss of weight, decrease in egg production, high morbidity, low mortality rates and it’s public health importance (zoonotic).
Economic importance

2. Drop in egg production (20-30%).
3. Zoonotic importance (food borne infection) (due to inadequate refrigeration and improper handling of the carcass at processing).
4. It is considered as an occupational disease affect staff of poultry at the processing plants due to un-defective handling of contaminated materials inducing severe mucoid to haemorrhagic enteritis, nervous signs and high mortalities in human being.
The causative agent

- Campylobacter species (*C. jejuni, c.coli and C.laridis or C.lari*).

- It is gram-negative, very small curved or spiral (S) shape rods.

- Uni-flagellated organism, motile with a Characteristic cork screw or darting motion under dark field microscope.

- It is a thermophilic organism needs 37°C-42°C and grow under microaerophilic conditions (need 10% Co2 in the Co2 incubator or candle Jar, 5% oxygen and 85% nitrogen).
The causative agent

- Campylobacter species could be propagated in vitro (tissue culture system), in ECE (Cause embryo death after yolk sac inoculation).

- Campylobacter species isolated on blood agar media (ovine, bovine, equine or avian), brucella agar, Campy-Cefex plates after addition of certain antibiotics (bacitracin, novobiocin, trimethoprim and colistin).

- Colonies on blood agar are non-haemolytic, usually 1–2 mm in diameter (may be pinpoint to several mm in diameter)
  - Smooth
    - Shiny
    - convex
    - defined edge or flat
    - transparent, or translucent
    - colorless or creamy
The causative agent

- *C. jejuni* is sensitive to 10% Formaldehyde solution (destroy the organism within 15 min, 0.15% organic phenol and 1:50000 QAC that kill it within a minute).

- *C. jejuni* is sensitive to desiccation (dryness) as it survives in a dry environment for longer than a few hours. The organism can persist in moist biological material for up to 5 days and for longer periods in water and biological films lining piping and tanks.
The causative agent

- All campylobacter species do not ferment the carbohydrates, positive catalase and negative indol.

- *C. jejuni*, *C. coli* are nalidixic acid Sensitive, while *C. laridis* is resistant (differentiation), also *C. jejuni* is positive hippurate Hydrolysis, while *C. coli* and *C. laridis* are negative.
Campylobacter jejuni organism
Susceptibility

- Most of avian species are susceptible to the infection.

- Chickens, turkeys, ducks, geese, pigeons, quails and pheasants could be infected with *C. jejuni* and *C. coli*.

- Free living marine birds like seagulls could be infected with *C. laridids*.

- All ages are susceptible to the infection but older ages (layers) and breeders are more susceptible.

- Broiler chickens could be infected at 2 weeks of age.
Mode of infection and transmission

- The organism present in high concentration in the intestine (commensally) and bile of the infected birds, so the dropping of the birds play an important role in the infection and transmission of the disease.

- Infection can occur through:
Mode of infection and transmission

- Horizontal transmission of Campylobacter organisms through fecal-oral route
  Ingestion of contaminated food and water by the droppings of the infected birds or infected litters (the intestinal infection persist up to 63 days in broilers kept on wire floor).

- Mechanical transmission through insects as house flies and cockroaches (transmit the organism from contaminated litter to susceptible birds.

- Free living birds transmit the infection to the commercial flocks.
Mode of infection and transmission

There's no evidence show that campylobacter organisms can transmitted vertically either through the ovaries or through egg shell contamination or penetration after ovi-position due to the followings:

1. The organism is sensitive to desiccation.
2. Discard dirty eggs.
3. Cleaning, disinfection and fumigation of eggs.
Clinical signs

1. Mucoid or bloody diarrhea.
2. Retardation of growth.
4. Decrease in egg production in layers (20-30%).
5. Morbidity rate 40% and low mortality rate.

(The severity of signs depends on the infective dose, strain, age, immuno-suppression and presence of other infections).
1. Severe enteritis (Distention of the intestinal tract from the dudenum to the caecum with watery or mucoid, sometimes haemorrhagic fluids).

2. The liver is enlarged with star (asterisk or satellite) shape focal necrosis on its surface with sub-capsular haemorrhages.

3. Degeneration of ovarian follicles.

4. Myocardial degeneration (necrosis) and hydropericardium may be seen.

5. Ascitis may seen at choronicity.

6. Atrophy and watery bone marrow.
Focal necrosis of the liver.
Diagnosis

- The sample could be taken from the intestinal contents, liver, bile, heart and ascetic fluids.

- Samples could be taken from living birds either from cloacal or faecal swabs or from heart blood.

- Due to severe sensitivity of the organism to desiccation so it requires special precautions during sample transportation & transport in ice box or in the following transportation media).
Diagnosis

- Swabs should be put in transported media (Cay-Blair, Butzler’s, Campy-BAP, Blaser’s and Skirrow’s, Blaster’s BU40, Stuart’s, Preston and selective media contains brucella agar, blood agar base, ovine, bovine or equine blood), the media should be contain antibiotics (bacitracine, novobiocine, polymixine B, trimethoprim, colistine and cephalothin) as inhibitors to any bacterial contaminants.

- A blood free selective media contain charcoal, campychoc agar and a charcoal and blood free media could be used.
The organism is thermophilic requires 37-42°C to grow under microaerophilic conditions (10% CO2, 5% oxygen and 85% nitrogen) in commercial gas panks, torbal or candle jar or in CO2 incubator for 2-3 days.

Primary isolation revealed flat, translucent, gray colonies have a tendency to coalesce. Sometimes, raised, opaque, brown gray colonies with discrete margin. Swarming colonies attributed to high moisture.

Colonies are non-haemolytic on blood agar.
Campylobacter organisms could be inoculated into CAM of ECE or I/V inoculation of the embryos with the faecal material or bile or liver suspension which resulting in embryonic death 11 days post inoculation. Yolk sac inoculation revealed death of the embryo with congestion and hepatic necrosis.

Campylobacter organisms could be inoculated on tissue cultures like Chinese Hamaster Ovary Cells and Hela cells.

Campylobacter organisms could be inoculated in laboratory animals like rat, mice (I/C induces nervous signs), rabbit (I/P induces hepatic necrosis), hamster and G. pig.

The organism could be inoculated I/P or I/M in day old poults or chicks.
Diagnosis

- Campylobacter organisms are gram-negative spiral or comma shaped curved rods, S shaped or “Seagull winged” shaped organisms. They are motile posses single polar flagellum.

- It could be observed with characteristic darting motility under dark filed illumination microscope.

- Campylobacter species are unable to ferment carbohydrates energy released from the degeneration of amino acids. They are positive oxidase, catalase and selenite, rapid producers to H2S and reduce nitrates but negative indole and urease.
## Diagnosis

<table>
<thead>
<tr>
<th></th>
<th>C. Jejuni (I, II, III, IV)</th>
<th>C. coli (I, II)</th>
<th>C. laridis (I, II)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Naldixic acid sensitivity</strong></td>
<td>Sensitive</td>
<td>Sensitive</td>
<td>Resistant</td>
</tr>
<tr>
<td><strong>Rapid H2S production</strong></td>
<td>-, -, +, +</td>
<td>___</td>
<td>+</td>
</tr>
<tr>
<td><strong>DNA hydrolysis</strong></td>
<td>-, +, -, +</td>
<td>-, +</td>
<td>-, +</td>
</tr>
<tr>
<td><strong>Hippurate hydrolysis</strong></td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>
Diagnosis

- Serotyping of Campylobacter species:
  1. **Panner scheme:**
     Depends on soluble heat stable (O antigen lipopolysaccharide) that identify 60 Serotypes of C. jejuni.
  2. **Lior scheme:**
     Depends on heat labile (H antigen).

- Panner scheme is more specific and faster than Lior scheme.
- Restriction endonuclease hydrolysis is also used for differentiation.
Prevention

1. Removal of infected litters, followed by thorough cleaning and disinfection of the house, then rest period for at least 7 days to complete eradication of infection.

2. Rearing the birds on wire floor to reduce the possibility of infection transmission.
Prevention

3. All in –all out policy.

4. Restrict the movement of the persons.

5. Eradication of free living birds, rodents and insects.


7. Thorough cleaning and disinfection of the equipments as feeders and drinkers using QAC and phenol.

8. No recycling of the litter.

9. There is no available vaccine.
10. Avoid infection of human by exposure of the carcasses in the slaughter plants to Gamma irradiation or pasteurization to reduce the number of the organism without induction of any undesirable change in the product like organoleptic or biochemical changes.

11. Post processing decontamination of the carcasses (lactic or acetic acids) treatment rinse effectively to limit the organism.
12. Using of probiotics (organisms producing acids like lactobacillus species, pediococcus species) as preventive measures (in water or feed) to competitively exclude the organism before colonization.
Control

1. Quarantine measures on the affected farm.

2. Hygienic disposal of dead birds.

3. Thorough cleaning and disinfection. Furazolidons, tetetracyclines and gentamycin are effective in the treatment.

4. Treatment must be followed by restoration of the normal intestinal flora.
THANK YOU