Post Weaning Diarrhea in pigs

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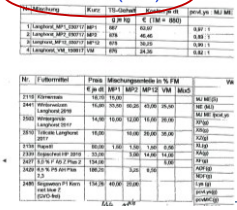
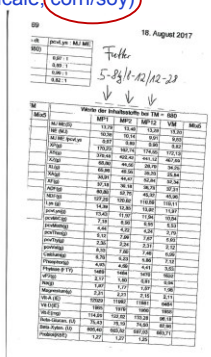
Anamnesis (mail from vet)

- Farm with 250 sows
- Farmer mixes the feed by himself
- Experimentation with new feed
- Acute post weaning diarrhea
- Increased mortality (~13 kg)

Feed composition

- Grain based (wheat, barley, triticale, corn/soy)
- Low in protein
- High in vitamines
- Probiotics (low)





PWD prophylaxis

- Clex met 12 drink:
  - Betain, Vitamin B12, minerals, methionine, propionic acid, citric acid, orthophosphoric acid and formic acid
- Post weaning: Colistin + zinc (Enteroxid), zinc (Tan-o-line)

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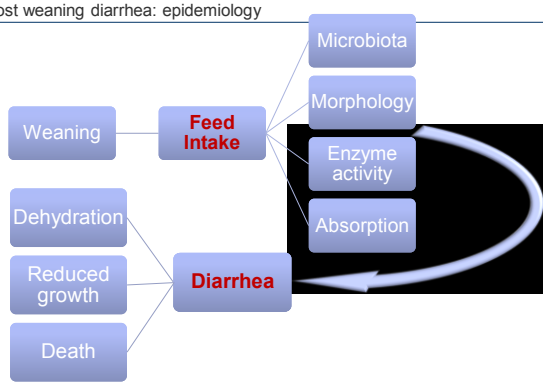
Post weaning diarrhea: epidemiology



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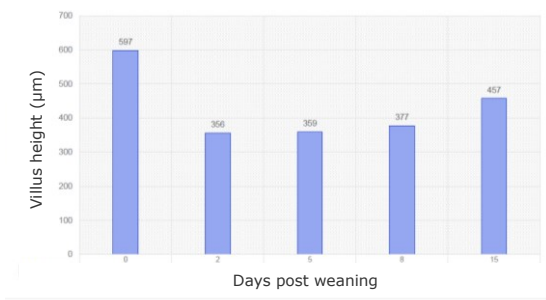
Villus length post weaning



Montagne et al. (2007)

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Necropsy findings (13 kg)

- Oedema of nasal bridge
- Leptomeningitis
- Hyperemic mesenterial vessels
- Hyperplasia of mesenterial lymphatic nodes
  - *E. coli* O139:K82 (+++)
- Small intestines with mucosa
  - *E. coli* O139:K82 (+++)

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Post weaning diarrhea: pathogenesis

- *Escherichia coli*: ETEC
  - Virulence factors
    - Adhesins (F4, F18)
    - Enterotoxins (fluidity, water absorption)
  - Often resistant to wide range of antibiotics
  - 10^9 – 10^{10} cfu cause clinical symptoms
  - Protective immunoglobulins in colostrum and milk

Fimbrial adhesins	Serovirotypes
F4	O149:LT:STb:EAST-1
	O149:LT:STa:STb:EAST-1
	O149:LT:STb
F18	O149:LT:STb:EAST-1
	O138:STa:STb
	O138:LT:STb:EAST-1:Stx2e
	O139:Stx2e:(AIDA)
	O147: STx:STb:AIDA

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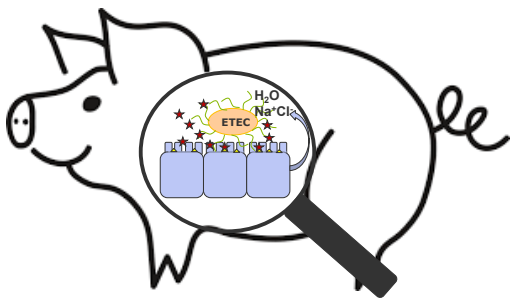
Post weaning diarrhea: pathogenesis



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Prophylaxis and therapy

- Antimicrobials
  - Enrofloxacin, apramycin, cefitofur, neomycin, gentamicin, amoxicillin/clavulanic acid, trimethoprim/sulfonamide, colistin

27 July 2016
EMA/CVMP/CHMP/231573/2016
Committee for Medicinal Products for Veterinary use (CVMP)
Committee for Medicinal Products for Human Use (CHMP)

antibiotic resistance common

Updated advice on the use of colistin products in animals within the European Union: development of resistance and possible impact on human and animal health

Colistin, fluoroquinolones and 3rd- and 4th-generation cephalosporins should be reserved for those occasions when there are no effective alternative antimicrobials authorised for the respective target species and indication.

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Prophylaxis and therapy: nutrition

- Minerals
  - Zinc (2400-3000 ppm)
    - epithelial barrier
    - Reduced cell damages by ETEC
    - Inflammatory cytokines
  - Copper
    - Oxidative damage to bacteria
- Acidifier
  - Solid feed increases stomach pH
  - Organic acids

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Prophylaxis and therapy: nutrition

- Probiotics/Direct Fed Microbials (DFM)
  - *Streptococcus, Bifidobacterium, Bacillus, Lactobacillus, Enterococcus,* yeast
  - Strain dependent
  - Multi strains, multi species
- Prebiotics
  - Oligosaccharides, lactulose, inulin
- Phytobiotics
  - Plant extracts and essential oils
  - Macleaya cordata, garlic (allicin), clove, cinnamon, fenugreek, thyme, oregano, sanguinarine, Mexican pepper, Acatia nilotica, Syzygium aromaticum, Cinammon zeylanicum, mint, rosemary, Macrocephala…

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Prophylaxis and therapy

- Feed enzymes
- Clay minerals
- Milk products
- Antimicrobial peptides
- Nucleotides
  - Regulatory, structural and metabolic function
  - Immune system
  - Re-dox balance

Prophylaxis and therapy

- Vaccines
  - i.m., F4
  - p.o., live attenuated/wild type
  - p.o., purified fimbriae
- Blood plasma
  - Antibodies
- Egg yolk antibodies
  - Laying hens immunized with fimbrial antigens
  - Before infection
- Bacteriophages
  - PP01, cocktail

Recommendations: nutrition

- Water with glucose and electrolytes
- Creep feeding from 2 weeks of age, no feed restriction
- Consider to use corn instead of soy
- Consider to use dairy products in starter feed
- Weaning at 28 days or later
- Consequent application of organic acids
- Blood plasma
- Pre- and probiotics
- Consider lower zinc levels

Further recommendations

- Susceptibility test *E. coli* isolates
- Adjustment of antibiotic treatment if necessary
- Vaccination
- Optimize rearing conditions

Thank you

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Post weaning diarrhea: predisposers

Stress	Creep feeding yes/no	Hygiene
• Nutritional • Psychological • Environmental • Immune system • Feed intake	• < 2 weeks of age • Frequent & fresh • Feeder space • Feed additives • Feed intake • Adaptation	• Growth • Immune response • Inflamatory response • Amino acid requirement • Feed intake