Swine Plasma Immunoglobulins for Prevention and Treatment of Post-Weaning Diarrhoea
Optimizing Stability Towards Gut Conditions

Hedegaard, Chris Juul; Ballegaard, Anne-Sofie; Røjel, Nanna; Bendix Hansen, Marie; Kjær Lindved, Bodil; Bisgaard Frantzen, Kirsten; Larsen, Lars Erik; Lihme, Allan; Heegaard, Peter M. H.

Publication date:
2013

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
STABILITY TOWARDS GUT CONDITIONS

Swine Plasma Immunoglobulins for Prevention and Treatment of Post-Weaning Diarrhoea: Optimizing Stability Towards Gut Conditions

Chris Juul Hedegaard¹, Anne-Sofie Ballegaard¹, Nanna Rejel¹, Marie Bendix Hansen², Bodil Kjær Lindved³, Kirsten Bisgaard Franzen⁴, Lars E. Larsen¹, Allan Lihme², and Peter M.H. Heegaard*¹


Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.

Materials & Methods

Immunoglobulin isolation:

Porcine Igs were purified from blood plasma at UpFront Chromatography A/S (Copenhagen) by high-volume Expanded Bed Adsorption with a proprietary adsorbent. Plasma was obtained from a Danish slaughter house. The immunoglobulins were multimerised by controlled periodate oxidation of immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed by visualisation by silver staining or Western blotting; the primary antibody: biotinylated mouse anti-pig Fc antibody (BD, clone F007-1241); developed by alkaline phospatatse-streptavidin and NBT/BCIP.

Conclusions

Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.

Materials & Methods

Immunoglobulin isolation:

Porcine Igs were purified from blood plasma at UpFront Chromatography A/S (Copenhagen) by high-volume Expanded Bed Adsorption with a proprietary adsorbent. Plasma was obtained from a Danish slaughter house. The immunoglobulins were multimerised by controlled periodate oxidation of immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed by visualisation by silver staining or Western blotting; the primary antibody: biotinylated mouse anti-pig Fc antibody (BD, clone F007-1241); developed by alkaline phospatatse-streptavidin and NBT/BCIP.

Conclusions

Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.

Materials & Methods

Immunoglobulin isolation:

Porcine Igs were purified from blood plasma at UpFront Chromatography A/S (Copenhagen) by high-volume Expanded Bed Adsorption with a proprietary adsorbent. Plasma was obtained from a Danish slaughter house. The immunoglobulins were multimerised by controlled periodate oxidation of immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed by visualisation by silver staining or Western blotting; the primary antibody: biotinylated mouse anti-pig Fc antibody (BD, clone F007-1241); developed by alkaline phospatatse-streptavidin and NBT/BCIP.

Conclusions

Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.

Materials & Methods

Immunoglobulin isolation:

Porcine Igs were purified from blood plasma at UpFront Chromatography A/S (Copenhagen) by high-volume Expanded Bed Adsorption with a proprietary adsorbent. Plasma was obtained from a Danish slaughter house. The immunoglobulins were multimerised by controlled periodate oxidation of immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed by visualisation by silver staining or Western blotting; the primary antibody: biotinylated mouse anti-pig Fc antibody (BD, clone F007-1241); developed by alkaline phospatatse-streptavidin and NBT/BCIP.

Conclusions

Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.

Materials & Methods

Immunoglobulin isolation:

Porcine Igs were purified from blood plasma at UpFront Chromatography A/S (Copenhagen) by high-volume Expanded Bed Adsorption with a proprietary adsorbent. Plasma was obtained from a Danish slaughter house. The immunoglobulins were multimerised by controlled periodate oxidation of immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed by visualisation by silver staining or Western blotting; the primary antibody: biotinylated mouse anti-pig Fc antibody (BD, clone F007-1241); developed by alkaline phospatatse-streptavidin and NBT/BCIP.

Conclusions

Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.

Materials & Methods

Immunoglobulin isolation:

Porcine Igs were purified from blood plasma at UpFront Chromatography A/S (Copenhagen) by high-volume Expanded Bed Adsorption with a proprietary adsorbent. Plasma was obtained from a Danish slaughter house. The immunoglobulins were multimerised by controlled periodate oxidation of immunoglobulin-bound carbohydrate (Fig. 1). The multimerisation process was stopped by increasing pH to 12. Cross-coupled Ig-species were analysed by visualisation by silver staining or Western blotting; the primary antibody: biotinylated mouse anti-pig Fc antibody (BD, clone F007-1241); developed by alkaline phospatatse-streptavidin and NBT/BCIP.

Conclusions

Background

Post-weaning diarrhea (PWD) is a common condition in intensive swine production, resulting in reduced welfare of weaners and economic losses for the farmer as a result of illness, death, treatment costs, e.g. high consumption of antibiotics and zinc oxide.

Aim

1. Developing feed additives for oral provision for protection against PWD based on natural antibodies (immunoglobulins) derived directly from inexpensive raw materials.
2. To increase stability (reducing gut proteolysis) by cross-linking the immunoglobulins (Igs).

Conclusions

- The optimal conditions for Igs-multimerisation were observed to be at pH 9 using 5-10 mM NaIO₄, which confers to increased reactivity towards Salmonella Diarizoriae after pepgin digestion.
- These results suggest that cross-linked Igs could be used for prevention/treatment of PWD and reduce antibiotic consumption.