**<Report Title>**

**<PROJECT ID>**

**Final Report prepared for the**

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**By**

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# Executive Summary

Concise summary which covers the:

* Rationale for undertaking the Project;
* Major outcomes of the project;
* Relevance of the project’s outcomes to the Australasian Pig Industry.

An Executive Summary is a report, proposal, or portfolio, etc in miniature (usually one page or shorter). That is, the Executive Summary contains enough information for the readers to become acquainted with the full document without reading it. Usually, it contains a statement of the problem, some background information, a description of any alternatives, and the major conclusions. Someone reading an Executive Summary should get a good idea of main points of the document without becoming bogged down with details.

An Executive Summary differs from an abstract in that an abstract is usually only about six to eight lines long. Its purpose is to inform the reader of the points to be covered in the report without any attempt to tell what is said about them. Covering no more than a page in length, the Executive Summary is longer and is a highly condensed version of the most important information the full document contains. Both the Executive Summary and the abstract are independent elements rather than a part of the body of the document. Both are placed at the beginning of the document.

With the possible exception of the conclusion and recommendation, the Executive Summary is the most important part of a report. As such, it should be the best-written and most polished piece of the document. This is because many readers may only look at the Executive Summary when deciding whether or not to read the entire document. You may expect that an Executive Summary will be read more frequently and by more people than will your entire document.

When writing the Executive Summary, ask yourself if those who read it will be those who will read the entire report. If you are dealing with two different groups of people, you will have to decide how much technical detail to include in the summary. If it is likely that some who read only the Executive Summary will not have the technical background of the writer or final reader, keep the technical information and vocabulary to a minimum.

You might have three types of readers:

* those who want a full picture but won't check the details (they might read the Executive Summary, some of the body, the conclusions, and the recommendations);
* those who read everything (they read the appendixes, all the data, the calculations, etc.);
* those who are in executive positions, wish to be kept informed on what is going on in the company, and will say "yes" or "no" to a project (they will read the Executive Summary, the conclusions, and the recommendations).

Your Executive Summary must address all three types of readers.

Since the Executive Summary is a condensation, when creating it, omit any preliminaries, introductory or transitional material details, and illustrative examples. Include the main ideas, the facts, the necessary background to understand the problem, the alternatives, and the major conclusions. Brevity and conciseness are the keys to a well-written summary. Ensure the Executive Summary is accurate and representative of your full document. It should not be misleading, but it should give readers the same impression as if they had read the entire report.

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# Introduction

This project aimed to test a bromelain-based formulation (BONIFF) in combination with a Semi-Moist Extruded Creep (SMEC) feed in weaning pigs under an enterotoxigenic *Escherichia coli* (ETEC) challenge to determine the efficacy of this combined formulation on aspects of piglet health and performance after weaning.

Post-weaning diarrhoea (PWD) is one of the major problems in the Australian (and world) swine industries causing economic losses and decreases in the performance and survival of weaned pigs. The diarrhoea is caused by strains (types) of enterotoxigenic *E. coli* (ETEC) that adhere to receptors on the enterocytes and colonise the surface of the small intestine. The enterotoxins produced enhance the net secretion of water (i.e., into the intestines) to cause diarrhoea (Pluske et al., 2018). Traditionally, antibiotics have been used for the prophylactic treatment of these pathogenic bacteria. However, rising concerns about antimicrobial resistance (AMR) caused by feeding antibiotics or other compounds such as zinc oxide (ZnO) and the ban of antibiotic-based growth promoters (AGP) and prophylactic antibiotic use in a growing number of countries has compelled the search for alternatives to in-feed antibiotics (Pluske, 2013). The issue of AMR is growing worldwide and therefore in the pork industry (Pollock et al., 2020), alternatives to traditional preventative compounds such as ZnO and AGP are urgently needed to maintain pig health and welfare.

Bromelain-based compounds, a proteolytic extract from pineapples (stems), have been shown previously to reduce PWD significantly in pigs by preventing attachment of the ETEC to the receptors in the small intestine (Mynott et al., 1996). Detach® is a commercial product registered in Australia (Anatara Lifesciences) for the prevention of PWD in pigs, and has been shown to reduce PWD and provide similar protection to antimicrobial agents including ZnO (Holyoake and Mynott, 2017) as well as reduce AMR (Collins and Bowring, 2017). However, Detach® is a paste and hence requires labour effort to deliver the compound (i.e., orally) to pigs after weaning. A revised formulation (BONIFF) can be applied to a dry feed and fed to pigs after weaning, reducing the need for labour effort and simplifying the entire process. In combination with SMEC, semi-moist extrruded creep feed, that has been shown to improve performance after weaning (Pork Cooperative Research Centre Final Report; 2010), BONIFF in combination with SMEC, as the practical vehicle to easily provide the BONIFF, has potential to (a) reduce PWD caused by ETEC and (b) improve performance in the post-weaning period.

*References:*

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Sterndale, S.O., Evans, D.J., Mansfield, J.P., Clarke, J., Sahibzada, S., Abraham, S., O’Dea, M., Miller, D.W., Kim, J.C. and Pluske, J.R. (2019). Effect of mucin 4 allele on susceptibility to experimental infection with enterotoxigenic F4 Escherichia coli in pigs fed experimental diets. Journal of Animal Science and Biotechnology 10: 56 (doi.org/10.1186/s40104-019-0366-1).

Sterndale, S.O., Miller, D.W., Mansfield, J.P., Kim, J.C., O’Dea, M. and Pluske, J.R. (2019). Technical note: novel delivery methods for an enterotoxigenic Escherichia coli infection model in MUC4-locus sequenced weaner pigs. Journal of Animal Science 97: 4503-4508.

# Methodology

*Animals, experimental design, housing*

On the day of weaning, approximately 21 days, and after on-farm selection for bodyweight (BW), 100 newly-weaned male pigs were transported to Murdoch University from a commercial farm. Pigs were allocated to their respective treatment groups on the basis of BW between the groups. Pigs in all treatments received their allocated diet *ad libitum* for 10 days after weaning. Thereafter, they all received the same commercially available weaner diet (Barastoc….) *ad libitum*.

The five experimental diets in the study were as follows:

1. Standard diet fed for days 1-10 after weaning, NO ETEC challenge;

2. Standard diet fed for days 1-10 after weaning, WITH ETEC challenge;

3. BONIFF/SMEC fed for days 1-10 after weaning, WITH ETEC challenge;

4. BONIFF/SMEC fed for days 1-10 after weaning, NO ETEC challenge;

5. SMEC fed for days 1-10 after weaning, WITH ETEC challenge.

Pens were kept in groups of 5 pigs per pen with 4 pens allocated per dietary treatment (n=20) in a building maintained at ~28° C. Temperature was decreased by ~2° C after 12 days maintained at ~26° C thereafter. Pigs were maintained within these treatment groups for 28 days after weaning, at which point the study finished. Individual pig weights and pen feed disappearance were recorded at regular intervals throughout the experiment to assess average daily gain (ADG), average daily feed intake (ADFI) and feed conversion ratio (FCR; g of ADFI per g of ADG).

*Diets*

A total of four diets were used in the experiment

without ZnO or organic acids

*Enterotoxigenc* Escherichia coli *challenge and monitoring*

On days 6 and 7 after weaning, some pigs will be orally challenged with an ETEC inoculum with a gelatine capsule containing F4-ETEC (serotype O149) at approximately 3-8 x 109 cfu/mL (after Sterndale et al., 2019). Unchallenged pigs will be sham-inoculated with phosphate-buffered saline. The faecal consistency, β-haemolytic E. coli shedding and diarrhoea index will be recorded for the following. Therapeutic antibiotic treatments, removals and mortalities will be recorded.

that are MUC4+ susceptible (200 pigs will need to be tested prior to the study commencing according to the procedures of Sterndale et al. 2019)

# Outcomes

Research results

# Application of Research

Application of the research findings in the commercial world.

Opportunities uncovered by the research

Commercialization/Adoption Strategies

* Potential benefits to cost of production
* Ease of adoption by producers
* Impact of the research

# Conclusion

Closing summary of Research

# Limitations/Risks

To the application of the research findings

# Recommendations

As a result of the outcomes in this study the following recommendations have been made:

# References

# Appendix 1 - Notes

## Confidential Information

If a Final Report contains Confidential Information:

* The Researcher must indicate on the cover of the Final Report that the Final Report contains Confidential Information.
* APRIL may request the Researcher to produce a non-confidential version of the Final Report in a form suitable for general distribution, and the Researcher must do so within 28 days of receiving the request.

## Deficient Report

If APRIL reasonably forms the view that the Final Report does not adequately set out matters referred to, it must notify the Researcher of the extent to which it believes the Final Report is deficient.

# Appendices

## Appendix 1: