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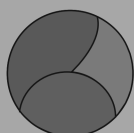
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# Advances in Animal Biosciences

Proceedings of the XIII<sup>th</sup> International Symposium on  
Ruminant Physiology (ISRP 2019),  
3–6 September 2019, Leipzig, Germany



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# ***Advances in Animal Biosciences***

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*Advances in Animal Biosciences* is an associated publication to the journal *animal*. It aims to publish high-quality conference, symposium and workshop proceedings about animal-related aspects of the life sciences with emphasis on farmed and other managed animals. These can be in the form of a book of abstracts, summaries or complete papers. The format will highlight the title of the meeting and organisations involved but the publications will have the added advantage of forming a series under *Advances in Animal Biosciences*.

Subject areas can include aspects of Breeding and Genetics, Nutrition, Physiology and Functional Biology of Systems, Behaviour, Health and Welfare, Livestock Farming Systems, Human Health and Product Quality.

However, due to the integrative nature of biological systems, monographs and conference proceedings dealing with the translation of basic and strategic science into the whole animal and farming system and the impact on Productivity, Product Quality, Food Security, the Environment, Climate Change and Humans will be particularly welcome.

## **Information for Conference Organisers**

The Animal Consortium together with Cambridge University Press offers conference organisers a package that enables publication of high-quality conference, symposium and workshop proceedings about animal-related aspects of the life sciences with emphasis on farmed and other managed animals.

Summaries, abstracts or full papers may be published in *Advances in Animal Biosciences* and high-quality invited papers from these meetings may be submitted and published as a defined series in *animal*.

Conference organisers interested in publishing their proceedings should send an outline proposal for publication in *Advances in Animal Biosciences*, *animal*, or both journals to [cko@cambridge.org](mailto:cko@cambridge.org). The publisher together with the Editors-in-Chief will then provide an estimate of costs and the procedures to be used.

Manuscripts submitted to *Advances in Animal Biosciences* will be reviewed by the Editor-in-Chief and papers submitted to *animal* will be peer reviewed. If accepted after review, proceedings will be published within 12 weeks of receipt by the Publisher.

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# Proceedings

of the

XIII<sup>th</sup> International Symposium on Ruminant  
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# 2019

## Advances in Animal Biosciences

This book is part of a series which is a companion to the journal ANIMAL



The Proceedings of the XIII<sup>th</sup> International Symposium on Ruminant Physiology constitute summaries of papers presented at the ISRP congress 2019 held at the KONGRESSHALLE am Zoo Leipzig, Germany, 3-6 September 2019.

The summaries have been edited. Views expressed in all contributions are those of the authors and not those of the organisers of the ISRP 2019.

This publication contains all the summaries that were available at the time of going to press.

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**Effects of replacing barley maize by citrus pulp in a dairy sheep diet on microbial populations in RUSITEC fermenters**

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Citrus pulp is a by-product highly available in the Mediterranean area. It is rich in rapidly degradable carbohydrates and it has been used in ruminant diets replacing partially the cereals with no negative effects on animal performance, but there is little information of its effects on microbial populations in the rumen. Two 50:50 forage:concentrate diets were used, with the concentrate containing either maize (20% fresh matter basis) or being totally replaced by citrus pulp. Four Rusitec fermenters were used in a cross-over design with two 14-day incubation periods, and three rumen-cannulated Merino sheep were used as ruminal content donors for inoculating the system. Samples of liquid and solid digesta were collected from the fermenters at the end of each incubation run. DNA was extracted and the abundance of bacteria and protozoa, as well as the relative abundance of fungi and archaea, were assessed by qPCR. Bacterial diversity was analysed using Automated Ribosomal Intergenic Spacer Analysis (ARISA). Data were processed using R with the vegan package. The number of peaks detected in the ARISA electropherograms and the Shannon's index were not affected by the inclusion of citrus pulp in the diet ( $P>0.05$ ). When representing the principal coordinates analysis based on Bray-Curtis distance, samples clearly grouped according to diet, suggesting different bacterial community composition. Abundance of bacterial and protozoa populations were similar in both diets in the solid digesta ( $P>0.05$ ), but the presence of citrus pulp in the diet tended to increase the abundance of bacteria ( $P=0.099$ ) and increased protozoa abundance ( $P=0.041$ ) in the liquid digesta. Relative abundance of archaea increased in the liquid digesta of the citrus pulp diet ( $P=0.024$ ), but there were no differences between diets ( $P>0.05$ ) in the solid digesta. Finally, fungi populations were affected by diet, with higher relative abundance in both solid and liquid digesta ( $P=0.001$  and  $P=0.022$ ) for the citrus pulp diet compared to the one containing maize. In conclusion, replacing maize by citrus pulp in a dairy sheep diet promoted changes in microbial populations and a greater abundance of microorganisms, especially in the liquid digesta of Rusitec fermenters, which might be related to the high sugar content of citrus pulp.