

# Short title

Kokumi flavour peptide production from beef offal co-products

Project code  
2024-1087

Prepared by  
Raise Ahmad, Jihan Kim, Scott Hutchings, Arvind Subbaraj &  
Rina Hannaford

Date submitted  
25/06/2024

**Disclaimer** The information contained within this publication has been prepared by a third party commissioned by Australian Meat Processor Corporation Ltd (AMPC). It does not necessarily reflect the opinion or position of AMPC. Care is taken to ensure the accuracy of the information contained in this publication. However, AMPC cannot accept responsibility for the accuracy or completeness of the information or opinions contained in this publication, nor does it endorse or adopt the information contained in this report.

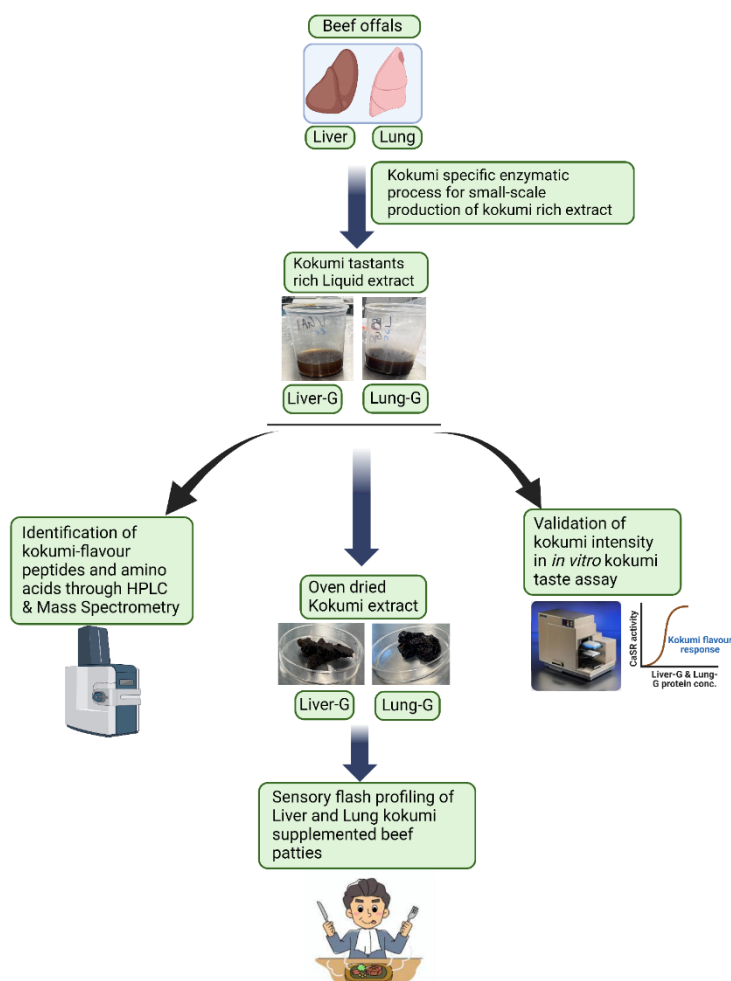
No part of this work may be reproduced, copied, published, communicated or adapted in any form or by any means (electronic or otherwise) without the express written permission of Australian Meat Processor Corporation Ltd. All rights are expressly reserved. Requests for further authorisation should be directed to the CEO, AMPC, Northpoint Tower, Suite 1, Level 29, 100 Miller Street North Sydney NSW.

## Project description

Offals are the non-meat co-products arising from meat processing/fabrication and are generated in large quantities on a daily basis. Despite co-products are generally an excellent source of high nutritive value protein, minerals and vitamins, they are considered as low value products and poses a challenge to industries to divert efforts into increasing their value to add to the business profit. Therefore, there is an urgent need to find novel strategies to add value to them to improve meat industry sustainability and profitability.

At AgResearch, we are working on enzymatic method to produce food grade kokumi flavour rich extract from a low value meat by-product for human consumption. We propose a proof-of-concept study to investigate beef offal co-products, liver and lung suitability to produce an extract enriched with kokumi taste substances i.e.  $\gamma$ -glutamyl peptides and selective free amino acids. Kokumi is an emerging flavour concept and hailed as a sixth taste in the realm of culinary arena worldwide. Originated in Japan, kokumi means “rich taste” and intriguingly enough kokumi substance do not taste anything itself but heightens the other tastes (savoury, sweet and salty) and prolongs their flavour when added to foods. To compare kokumi intensity of liver and lung kokumi extracts, we performed *in vitro* cell based human kokumi-calcium sensing receptor (CaSR) taste receptor assay. CaSR is activated by all kokumi taste substances in our taste buds to transmit information to brain to perceive distinct kokumi sensory attributes. To validate our findings of enrichment of kokumi peptides and intensity in *in vitro* CaSR activation assay, we performed a Flash Profile (FP) sensory trial on offal-kokumi extract supplemented beef patties.

## Project content



Schematic diagram showing research plan and methods employed for the project. Liver-G, kokumi peptide rich extract of liver; Lung-G, kokumi peptide rich extract of lung.

## Project outcome

Following two step enzymatic reaction, significant increases in kokumi- $\gamma$ -glutamyl peptides and FAA were observed in both Liver (Liver-G) and Lung (Lung-G) kokumi extract when compared to their non enzymatic treated water extract (Liver-W and Lung-W) respectively. Most importantly, enrichment of tripeptide,  $\gamma$ -Glu-Val-Gly (EVG) was observed only in Lung-G extracts which is widely reported as the most potent kokumi peptide in imparting desired kokumi flavour attributes in foods. To the best of our knowledge, the current study is the first to report enrichment of EVG in any offal extract samples through an enzymatic method. Notably, Lung-G exhibited strong kokumi intensity with higher potency and efficacy than Liver-G in *in vitro* kokumi-CaSR activation, which is suggestive that, when added to real food Lung-G is expected to produce stronger kokumi sensation and more desirable flavour at a lower dose than Liver-G. To validate these findings, the FP sensory

method was employed as a rapid descriptive sensory analysis to identify flavour attributes of five beef patties incorporated with Liver and Lung kokumi rich extracts. Lung-G supplemented patty was found to be distinct with heightened and more intense desirable flavour attributes of juiciness and saltiness, indicating strong effect of enriched kokumi substances. Conversely, Liver-G patties were not different than Liver-P and both were affected by undesirable attributes of offal, tripe, metallic and grassy.

Based on our data, we conclude that lung is a promising substrate to produce kokumi rich extract with high kokumi intensity which was able to impart desirable flavour attributes of juiciness and saltiness in beef patties.

### **Benefit for industry**

Meat offal co-products, including lung, are generally sold as low-value products. Lung, in particular, is not consumed as much as other co-products and is not considered an edible source in some countries, including New Zealand. Based on our study, Lung derived kokumi extract appears promising for valorising lung, potentially leading to profitable revenue for the business. The study demonstrated that lung-derived kokumi extract could be used as a flavour-enhancing ingredient, improving the saltiness and juiciness of beef patties and potentially other processed meat products. Using lung-derived kokumi extract aligns with the approach of maximizing the utilization of animal products in the meat industry. Moreover, leveraging its properties to enhance juiciness and saltiness could be beneficial for developing healthier meat products, reducing fat, salt, and other chemical additives in meat industry. This presents an opportunity to transform a low-value by-product into a high-value ingredient, opening new market avenues and enhancing the economic sustainability of meat processing operations.