

Newsletter

Issue no. 4 - October 2023



RIBMINS network during the 3rd and final scientific conference in Bucharest (Romania) in March 2023.

A word from the **RIBMINS** leaders



Bojan Blagojevic Chair, University of Novi Sad, Serbia.



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Welcome to the fourth and last RIBMINS newsletter.

This issue brings an update of our achievements during the last year of our COST Action, particularly the final RIBMINS conference, a virtual training school and our meeting with stakeholders.

The key results of our five working groups (WG) are also presented in this newsletter. Finally, we are proud to announce that a **RIBMINS Special Issue** of the journal *Food Control* will soon be released. This Special Issue brings together 17 scientific papers in the field of risk-based meat safety assurance.

RIBMINS as a European COST Action came to an end on 3rd September 2023. Based on the number of participants, the active engagement and the number of published papers, we conclude that RIBMINS has been a great success – we have achieved much more than we had hoped for. Our intention is to keep the network going in the future and continue our joint work on the development and implementation of modern risk-based meat safety assurance systems (RB-MSAS).

Bojan and Lis



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Edited by: RIBMINS

3rd RIBMINS Scientific Conference "Shaping the future of RB-MSAS"

The 3rd **RIBMINS** Scientific Conference took place on the 29-30th of March 2023 in Bucharest (Romania).

The University of Spiru Haret, under the lead of **Madalina Belous**, organised the conference following a hybrid format. A total of 134 participants (60 on-site and 74 online) from 40 countries joined the conference.

The conference was inaugurated by Bert Urlings, corporate director for quality assurance and public affairs at Vion Food Group, who gave an engaging and thought-provoking keynote address on contemporary meat safety standards and the role of meat inspection. Providing an industry viewpoint, he presented strategies to control the most critical hazards and stressed the relevance of incorporating new developments through Hazard Analysis and Critical Control Points (HACCP) following a scientific-based approach. Mick Bosilevac, from the United States Department of Agriculture in Nebraska, delivered the second keynote talk, on the post-abattoir RB-MSAS, highlighting the formation of biofilms due to contamination during processing and their associated risks even when a safety system of successful interventions is in place. The last keynote speaker was Katharina Stärk, from the Swiss Federal Food Safety and Veterinary Office, who gave an inspiring talk on how to translate research into practice in modern meat safety control systems. Taking a holistic view, she underlined the multiple pressing changes and the need to negotiate strategies that will allow us to achieve a sustainable food system.



Members of the RIBMINS network visiting Bucharest during the social event.

The conference brought together experts from industry, competent authorities (CA), and research, and it provided an opportunity to exchange perspectives and experiences on RB-MSAS. The five WG of the RIBMINS project presented the highlights of their results and raised awareness on the needs to update legislation and to embrace new technologies, like robotics and artificial intelligence, at all levels of the system. As the RIBMINS project ended in September 2023, this was the last scientific conference as part of this COST Action. The network is now working with dedication to finalise the last tasks in collaboration with the stakeholders in order to strengthen the successful implementation of the results.

The conference programme, book of abstracts, presentations and posters can be found here



Virtual training school on RB-MSAS focusing on risk categorisation of farms and abattoirs

The last training school of the RIBMINS project was organised jointly by WG2 and WG3, and it took place on the 13th-16th of June 2023. The aim of this 4-day online training school was to provide insights into the challenges of RB-MSAS, current European legislation and future trends, with a special focus on risk categorisation of farms and abattoirs. The training school had 26 trainers from academia, authorities, industry and EFSA, who covered a broad range of topics on RB-MSAS, changes and innovation in European legislation, case studies, risk analysis, and future trends in new technologies in meat inspection. In total, 51 participants attended the training school of which 48 were from European countries and three from non-European countries.

The virtual training school comprised 31 presentations and two group tasks focussing on sustainability and on risk categorisation of farms and abattoirs. The outcomes of the group tasks were presented and intensively discussed by the participants. The feedback from the participants was collected via a "word cloud" (see figure on the right). Attributes like "informative" and "inspiring" were mentioned the most with regard to the training school. All training material is freely available on the RIBMINS website.



Participants' anonymous feedback stressed the inspiring and educative mix of lectures, discussions, networking, and workshops.

Engaging with experts and stakeholders

The RIBMINS stakeholder meeting, "Safe(r) meat in a changing world", was held at the COST Association premises in Brussels, on 26th April 2023. The meeting brought together 49 stakeholders and experts from international organisations, industry, CA, and academia, who critically discussed the main challenges in implementing RB-MSAS in Europe and developed concepts for the future. The ensuing talks and vivid discussions during the meeting centred on the need for future meat safety systems in Europe that must find a balance between harmonisation of sciencebased guidelines and flexibility through the use of calibration and focus on risk-based principles. Continuous training of official veterinarians (OV) is another prerequisite for implementing legislative changes in meat inspection in different countries. Kris De Smet. from the European Commission Health and Food Safety (DG SANTE), stated that the remit of RIBMINS is to inform CA on new scientific and technological developments in order to make meat inspection more efficient in terms of food safety assurance and resources. Prof. Truls Nesbakken, from the Norwegian University of Life Sciences, pointed the crucial role of RIBMINS to follow up the EFSA opinions and even add new ideas for meat inspection that, in the end, might result in

risk-based meat inspection and RB-MSAS that protects consumers. The importance of future collaboration was stressed by Prof. Lis Alban, from the Danish Agriculture and Food Council, and Vice-Chair of RIBMINS, who said that RIBMINS has made it possible for researchers, food business operators and CA to meet and establish a platform for collaboration. Prof. Sophia Johler from the University of Zurich highlighted the central role of OV as risk managers in a state-ofthe-art RB-MSAS and pointed to the importance of continuous training and life-long learning to allow them to fulfil their duties to the highest standard. **Mario Silvestro**, from the Cremonini S.p.A. food company, emphasised that RB-MSAS is critical for ensuring the safety and the quality of meat products for human consumption. He stated that a RB-MSAS is also more cost effective and efficient in preventing the spread of foodborne illness compared to a more reactive approach and, therefore, is a crucial step towards ensuring the safety and integrity of the food supply chain.

The results of the meeting will be published as a roadmap/position paper that can be leveraged to direct future research and legislative efforts.

Read more about this event here



Participants at the stakeholders' meeting in Brussels (Belgium).

Short Term Scientific Missions (STSM) 2022-2023

STSM are funded institutional stays, with the aim of supporting mobility and collaboration between individuals and institutions, while contributing to specific objectives of the project. Nine STSMs were conducted in the last year.

Check all the STSMs summaries here.

STSM experiences

Michal Majewski

Poznań University of Life Sciences, Poland

STSM at the Danish Agriculture and Food Council (22nd August-4th September 2022)



Ludwig Maximilian University of

Philipp-Michael Beindorf



"One of the main goals of my work was an international mapping of monitoring and control of issues related to antimicrobial residues in pigs. Questionnaires had been completed by responders from 27 countries. We analysed the data and developed a method for presenting the results after processing the data, generated after collecting the electronic forms. I have significantly improved my practical skills in data analysis and interpreting results for scientific writing. Our collaboration continued after the end of the STSM, and the final result is the publication of two manuscripts describing best practices for detection and handling of antibiotic residues in meat. The most important advantages of this STSM were the opportunities to work in an international team and to take up new challenges. Working with the best experts in the field of food safety allowed me to broaden my knowledge in the field of risk assessment."



"The aim of this STSM was to test the effect of decontamination of pork belly with ultraviolet light (UV-C) treatment. Specifically, we investigated the relationship between time and dose of UV-C on the reduction of Salmonella spp. and Listeria spp. on the surface of fresh pork belly and its effect on the sensory quality of the products.

The results of the UV-C irradiation experiments suggest that this treatment has the potential to serve as an additional hurdle against microbial contamination in raw meat. The end report of this project will be published on the webpage of the Danish Technological Institute. Based on our findings, this project will be extended to conduct additional experiments and to establish a broader database."

Learn more about Philipp-Michael's experience

Joanna Dabrowska National Veterinary Research Institute, Poland

STSM at the Technical University of Denmark (26th April-17th May 2023)



"The purpose of the STSM was to receive basic training in whole genome sequencing (WGS) using Illumina and to gain bioinformatics support for genome analysis under the guidance of specialists. During my three weeks' stay I had a great opportunity to familiarise myself with the workflow of WGS using two platforms, namely NextSeq® 500 and Oxford Nanopore. An important part of my stay was learning the basic methods for data analysis using bioinformatics software.

The acquired experience and knowledge will be valuable for future research and collaborations. These new skills will be particularly useful in my study on foodborne pathogens for a meat safety assurance system, in line with the guidelines of the European Food Safety Authority."

Learn more about Joanna's experience

Learn more about Michal's experience

Maciej Kochanowski

Poland

STSM experiences

National Veterinary Research Institute,

STSM at the National Food Institute of

Denmark (26th April-17th May 2023)



"The mission primarily revolved around a comprehensive hands-on training in WGS using cutting-edge platforms, namely the NextSeq 500 and Oxford Nanopore MinION. This educational process equipped me with the ability to successfully conduct WGS and carry out an elementary bioinformatic analysis. The practicality of this analysis was demonstrated in the detection of antimicrobial resistance genes within DNA samples from 91 isolated Streptococcus suis strains, sourced from pigs in Poland.

Another pivotal aspect of the STSM was the specialised training I received in the field of susceptibility testing of bacteria using the Minimum Inhibitory Concentration (MIC) method.

This provided me with a crucial understanding of bacterial response to antibiotics. This proficiency in MIC analysis, coupled with the expertise in whole-genome sequencing, makes for a comprehensive skill set that will be of significant utility in the further examination and handling of antimicrobial resistance issues." Marta Kiš University of Zagreb, Croatia

STSM at the University of Liverpool (2nd-16th May 2023)



"The main focus of this STSM was to analyse risk-based controls measures of Yersinia enterocolitica in pigs to develop and optimise the protocol for chemical decontamination of pig carcasses at the abattoir.

STSM activities have improved my skills in conducting research studies, applying appropriate methodologies, and developing a critical approach to evaluate outcomes related to a specific hazard. In addition, I have improved my skills in conducting epidemiological analyses, prevalence estimation, risk categorisation of farms and statistical evaluation of the results. The results of this research will be published in a scientific paper and will significantly contribute to the scientific knowledge of this neglected bacterium. Also, the evaluated interventions at harvest level regarding meat decontamination will help in the implementation of the planned research project in a Croatian abattoir and eventually lead to the development of more effective control measures to reduce the risk to consumers."

Learn more about Marta's experience

Aneta Bełcik

National Veterinary Research Institute, Poland

STSM at the German Federal Institute for Risk Assessment (20th-26th May 2023)



"The aim of the STSM was to explore a method for the detection of Alaria spp. mesocercariae in wild boars by Matrix-Assisted Laser Desorption/Ionisation Time-of-Flight Mass Spectrometry (MALDI-TOF) technique.

This training was conducted during the daily laboratory work performed in the Department for Biological Safety, German Federal Institute for Risk Assessment (BfR). Additionally, there were many discussions with the experts in the field of Alaria spp. detection and identification as well as to consider future collaboration in Alaria spp. area, mainly in scientific publications and international projects.

This training gave me the opportunity to meet experts in the field of Alaria spp. analysis in another country and allowed me to exchange experiences in the scientific field, which were extremely inspiring and will make a great impact on my future research on Alaria spp."

Learn more about Aneta's experience

Learn more about Maciej's experience

Antimicrobial residues in Europe

What is done to protect consumers from exposure to meat, with residues of antimicrobials? The brief answer is, "A lot!" Still, adjustments are needed, and we have solutions for this

The protection of consumers against exposure to meat with residues of antimicrobials (AM) has been investigated by RIBMINS. The analysis was based on a collection of data from more than 26 countries in- and outside the European Union. Residues at levels above the maximum residue limits (MRLs) are found only infrequently and

Model A (monitoring) could reflect small abattoirs placing meat on the national market:

- detection of a residue at a level above the MRL is interpreted in the same way as a process hygiene criterion;
- requires on-farm inspection to correct future mistakes and no retention of tested carcases.

are likely as a result of non-compliance with withdrawal periods (WP) after AM treatment. However, errors on the farm might lead to detection of residues above MRL in the meat. We have developed two best practice models, balancing consumer safety with EU policy on minimising food waste.

Model B (surveillance) could reflect abattoirs also trading and exporting:

- detection of a residue at a level above the MRL is interpreted as a food safety criterion;
- requires on-farm inspection, and the tested carcass is retained to avoid expensive recalls.



Moreover, we have investigated what happens, when a pig producer mistakenly delivers pigs for slaughter prior to the end of the WP. Although WPs should be complied with, it is difficult to use compliance with WPs as a basis for decisions. Firstly, this is because WPs may differ between countries and even between products containing the same molecule. Secondly, the MRL could be complied with, despite the animals having been sent for slaughter too early: this scenario is likely due to application of safety factors when calculating the WP. We propose that the concentrations and amounts of residues present at the time of slaughter is calculated using an interactive exposure risk model, which can be found on: Survey on residues of antimicrobials in pigs – RIBMINS. Hereby, decisions can be made in a safe, evidence-based and efficient way.

For more information, please see:

- Alban et al., 2023. Food Control, 153. 109899 https://doi.org/10.1016/j.foodcont.2023.109899 | graphical abstract here
- Alban et al., 2023. Food Control, 154, 110000 https://doi.org/10.1016/j.foodcont.2023.110000 | graphical abstract within the document
- Lund et al., 2023. Food Control, 155, 100071 https://doi.org/10.1016/j.foodcont.2023.110071 | graphical abstract here

Working Groups (WG) Key results and knowledge gaps

This section highlights only part of the work developed by each WG. A comprehensive report on the work developed in RIBMINS will be available here in 2024, stay tuned!

WG1 - Scope and targets of meat safety assurance system (MSAS)

Leader: Ivar Vågsholm (Swedish University of Agricultural Sciences, SE), vice-leader: Simone Belluco (Istituto Zooprofilattico Sperimentale delle Venezie, IT)

Task	Summary of key results and knowledge gaps
Mapping existing MSASs in place	In the EU, there are several industry MSASs focused on farms, slaughter and/ or processing. There are large differences between countries and how their CAs acknowledge the work done by the industry. Some countries (e.g., Denmark) rely on the industry to itself achieve meat safety with a more hands off approach, while others countries maintain the official controls as the principal tool.
Identification of scopes of current and future MSAS	The MSAS could be run either by the food business operators (FBOs), by 3rd parties or by the public e.g., the CAs. The scopes for both official control programs and industry schemes are more focused on food safety, use of antimicrobials, animal health and welfare, as well as authenticity. However, industry schemes are much broader, including quality, geographic origin and organic farming. The future MSAS will have to be embedded into the FBO's overall quality assurance systems.
	The future aims are to transform the scientific knowledge into modern MSAS. The risk managers (RM) need to understand the social capital in the meat value chain so they can to align the behaviours of farmers, FBOs and CAs with technical knowledge. The social capital and food safety culture amongst farmers and FBOs is a key driver for successful meat safety, while information asymmetry increases risks for a tragedy of the commons scenario. Ostrom's core design principles for a stable commons could inform the design of MSASs. Tools for reducing the information asymmetry and building trust and social capital between all stakeholders within the meat value chain include the food safety culture, food chain information (FCI), use of health epidemiological indicators, sensors and block chains, industry/private standards, and the applied system approach from farm to fork.
Identification of roles, responsibilities, and competences within the MSAS	The FBO and CA are two separate professional figures with overlapping competences, but different tasks. The FBO is the RM, and in its everyday activity, deals with identified hazards and hold the primary responsibility for food safety. The CA enforces the regulations on meat safety and animal welfare using official controls to verify that FBOs properly manage food safety risks. The CA should act directly as a RM only when food safety is not guaranteed by FBO activities or when explicitly mentioned in legislation (i.e, meat inspection). The RM periodically audits specific parts of the FBO's MSAS and collects relevant information for the national CA. A RM working for a FBO deals with meat safety issues on behalf of the owner. Additionally, a FBO RM deals with animal welfare and all other quality issues linked to the wholesomeness of meat. Second and 3rd party assurance schemes are parallel MSAS that currently are not considered by the CA, or are considered only to a limited extent, or only in some countries.

Prioritisation of hazards and setting risk-related targets in the meat chain

EFSA identified several hazards for the different slaughtered species. Risk ranking is a helpful tool to prioritise and enable a RB-MSAS. The risk ranking at regional level should target identified hazards by setting food performance criteria. The EU has established performance objectives (prevalence targets) for Salmonella in poultry flocks as well as for Salmonella and Campylobacter on chilled (poultry) carcasses (process hygiene criteria). The community, national and regional risk assessments are informed by the ongoing monitoring and surveillance activities. These should be done under the supervision of the CA. Emerging meat borne hazards deserve more attention and show how a local level risk-based system is required to address specific risks. Unfortunately, on-site risk-based management activities are often fixed in HACCP procedure and are not frequently updated according to EU and national risk rankings and evaluations.

WG2 - Controls and risk categorization at farm level

Leader: Diana Meemken (Free University of Berlin, DE), vice-leader: Truls Nesbakken (Norwegian University of Life Sciences, NO)

Task	Summary of key results and knowledge gaps
Assessment of the effectiveness of pre- harvest meat safety interventions for bovines, pigs and broilers	A high herd health status combined with a functioning management and biosecurity system is successful in preventing and/or controlling relevant zoonotic agents at farm level for all animal species.
	Bovines: studies on pre-harvest interventions were mainly carried out for Salmonella and Shiga toxin-producing E. coli (STEC). The most effective interventions were cleaning and disinfection, biosecurity and vaccination, whereas feed treatment and additives had inconsistent outcomes.
	Pigs: studies on feed and water treatments as well as vaccination, focusing mainly on Salmonella, were the most frequent and showed predominantly positive effects. Research was rare on other relevant pathogens, like Yersinia, Toxoplasma and Hepatitis E virus.
	Broilers: studies mostly focused on Salmonella and Campylobacter. The tested interventions regarding management, biosecurity and feed yielded mixed outcomes. Studies on interventions to control or prevent other relevant pathogens were scarce.
Determination of the status quo and improvements on FCI and Harmonised Epidemiological Indicators (HEIs) for bovines, pigs and broilers in Europe	The implementation status and the FCI content for all three major food-producing livestock species vary widely according to our survey. Respondents from the broiler official control and slaughter sector rated the current status of the FCI as "mostly helpful", while respondents from the pig or cattle sectors frequently rated the FCI as "rarely" or "not helpful". The most commonly proposed parameters needed to improve FCI are the mortality rate, treatments, and information regarding abnormalities occurring during fattening. FCI needs to be improved/concretised urgently, specifically regarding meaningful content and predefined consequences to meet the intended purpose.
	Few HEIs were implemented for pathogens (mainly Salmonella) already regulated by EU standards and legislations. HEIs offer valuable information, particularly in the context of the RB-MSAS, but their implementation is still limited in Europe.

WG3 - Abattoir level controls and risk categorization of abattoirs

Leader: Dragan Antic (University of Liverpool, UK), vice-leader: Kurt Houf (University of Ghent, BE)

Task	Summary of key results and knowledge gaps
Assessment of the effectiveness of abattoir interventions in reducing microbiological load on carcasses and performance of computer vision systems (CVSs) in detecting carcass faecal contamination	Animal coat interventions proactively reduce carcass microbial contamination and deliver 1-1.5 log reductions in the transfer of bacteria to carcasses. Carcass pasteurisation treatments with hot water and/or steam have a consistent reduction effect of 1-2.5 logs in beef, pigs and sheep. The sequential use of carcass interventions as a part of multiple-hurdle approach delivers higher reductions than any of the interventions applied alone, from 2 to 3 logs. Hazard-based interventions can be recommended for use in abattoirs. Existing CVSs developed for overall MSAS of broiler carcasses and organs demonstrate very high sensitivities, but suboptimal specificities, whereas CVSs for pig and bovine are underdeveloped and not extensively used.
Investigation of the current status of abattoir risk categorisation in Europe and development of a risk categorisation method for abattoirs that incorporates Food Safety Management System performance assessment (FSMS-PA) and HEIs	Our survey of European CAs found that 78% of the respondents (14 European countries) implement some abattoir risk categorisation methods, mainly with the aim to adapt the frequency of official controls, but no country has formally included HEIs for this purpose. An abattoir holistic FSMS-PA tool was developed and includes key FSMS components, with assessment criteria and corresponding scores for the in-abattoir assessment of the components' implementation. A risk categorisation method was developed for pig abattoirs to categorise them as a 'low', 'medium' or 'high'-risk.

WG4 - Impact of changes and alternatives to traditional meat inspection

Leader: Ole Alvseike (Animalia, NO), vice-leader: Miguel Prieto-Maradona (University of Leon, ES)

Task	Summary of key results and knowledge gaps
Comparisons between the current and the future MSAS and assessment of cost-effect of individual tools in the MSAS	Current MSAS includes, in addition to the ante and post-mortem meat inspection, the already well-implemented approaches of HACCP, Good Hygienic Practices, Good Manufacturing Practices, and surveillance and control programs. However, further developments in the field of Information Technology, artificial intelligence and sensor technology must be taken into account, so they can be used in the field of food safety and pathology. MSAS will provide food in a cost-efficient way that does not yet exist in Europe. Infrastructures can vary regionally, as local conditions ownership and traditions play a role and should be considered.
Updating meat inspection lesion codes to improve decision-making and redefining condemnation criteria to minimise food waste	Based on an analysis of the systems in place for pigs, it was concluded that meat inspection codes are not harmonised in the EU. The differences concern the terminology, number of codes available, number of codes assigned per animal, and the way the codes in the list can be categorised. Official coding systems do not exist in all countries at a national level, sometimes are missing entirely and sometimes exist only at the regional level. Because the total condemnation findings are differently defined in the countries, comparability is limited and differences are related to the structure of the code system, the interpretation of the codes, or existing real differences in animal health. Not all 20 reasons for unfitness of pig meat given in the EU Food Inspection Regulation (EU) 2019/627 are reflected in the national code lists, and the individual codes could not always be linked to these EU condemnation for food safety and animal welfare reasons. A list of 40 new, aggregated codes was proposed and should be considered in a future discussion about more harmonised meat inspection. This would allow comparison between abattoirs and produce more meaningful data for the pig producers.

Harmonisation of procedures to assess meat fitness for human consumption During post-mortem inspection of finishing pigs, different combinations of lesions can be observed. In different national code lists, diverse total condemnation criteria and practical instructions regarding judgment are in place, but harmonisation is lacking. Suggestions for identifying the findings that reflect a generalised condition of disease and to look at whether findings reflect an acute disease stage or not, can help. In general, the meat inspectors' judgment depends on the individual case, and it is important that some flexibility in judging meat unfit for human consumption exists. However, basic principles for the interpretation of post -mortem findings should be harmonised

WG5 - Impact of changes and alternatives to traditional meat inspection

Leader: Sophia Johler (University of Zurich, CH), vice-leader: Claudia Guldimann (Ludwig- Maximilian University of Munich, DE)

Task	Summary of key results and knowledge gaps
Monitoring of MSAS implementation	While there is a general agreement that meat inspection should transition to RB-MSAS, our monitoring showed that the degree of implementation varies greatly between countries. The pig sector leads the transition, with 61% of countries having fully implemented new, more risk-based systems. To achieve the goal of full implementation, set by EFSA since 2013, communication and training were identified as key factors to facilitate confidence in RB-MSAS.
Leading communication efforts within RIBMINS	Scientific conferences were organised to facilitate exchange within the network, was a stakeholder's meeting to communicate RIBMINS results to key stakeholders (i.e., industry, RM, CA, non-profit organisations and academia). Regular newsletters about RIBMINS activities have been shared with a diverse audience.
Development of the training material for MSAS	A Europe-wide study was performed to characterise OV in terms of demography, employment conditions and training needs and to gain an overview of the widely variable continuing education systems across Europe. OVs in Europe are, on average, older (49 years) than the mean working population, biased towards males compared to all veterinarians, and work full time. Only 15% were dissatisfied with their employment. This shows that a transition to training and integrating younger female veterinarians into the field is a promising solution to correct the staff shortage due to retirement of OVs that is anticipated in many countries. To continue training efforts, RIBMINS output suitable for training purposes was compiled in a collection of publicly available training materials, available here. These could be integrated in on-site practical training sessions, which emerged as the preferred training method in our OV survey.





Get in touch with the network!

The Virtual Network Support led by Ole Alvseike will continue. This networking forum is a low threshold offer where professionals from academia, competent authorities and industry meet.

If you are interested in joining, please get in touch: ole.alvseike@animalia.no

The RIBMINS website will continue to be updated regularly, stay tuned!

Editorial board and Acknowledgements

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