

PPIC Technical Committee Meeting Minutes, Monday May 4th, 10:00 am to 12:00 pm, via Zoom

In attendance: Pam Ismail – UMN, PPIC Director
Amy Mathiowetz – UMN, PPIC Manager of Operations
Gary Reinnecius – Professor Emeritus, UMN
Lolly Occhino – AURI
Clint Johnson – ConAgra Brands
Seyhun Gemili – ADM
Steve Hess – Hershey
Carrie Lendon – Cargill
Gabriela Perez-Hernandez – Kellogg
Wajira Ratnayake – Ingredion
Lehan Patrick – Saputo
Yui Maneephan Keeratiurai – Danone
Sara Rosene – General Mills

1) Introductions and Welcome to Sara Rosene from General Mills, Yui Maneephan Keeratiurai from Danone, and New ADM representative Seyhun Gemili

- a. General Mills upgraded their membership from Associate to Partner level; GMI Technical Committee representative is Sara Rosene – Protein Team with Nutrition & Technology Solutions Group
- b. Yui Maneephan Keeratiurai – Technical Leader, Science & Technology Teams at Danone Norther America, and leads several workstreams in Plant-Based Center of Excellence
- c. Seyhun Gemili – Director of Protein Research at ADM

2) Quick re-cap of previous meeting (minutes in *Appendix 1, pg. 3 of meeting agenda*)

3) Updates

Objectives:

- a. **Update on Proposal to GFI:** submitted pre-proposal and got invited to submit a full proposal; Title: “Characterizing and Texturizing Proteins from Pulses to Form Fibers with Textures that Mimic Chicken”; Three interdisciplinary researchers (Zata Vickers, Job Ubbink, and Pam Ismail); Funds requested: \$250,000 (**FUNDED**)
- b. **Update on FFAR proposal submitted to Plant Protein Enhancement Project;** Title: Legumes of the future: Developing methodologies and germplasm to enhance the functionality and nutritional quality of pea protein; Five interdisciplinary researchers; Funds requested: \$1,167,797 (Still PENDING, we should hear back in the summer)
- c. **Updates on currently funded PPIC projects:** Q2 reports shared with Tech Committee
 1. “*The Impact of Cold Plasma Treatment on Pea Protein Structural and Functional Characteristics* (Ismail et al.)
 2. *An Interdisciplinary Strategy for Improving Hemp Protein as a Food Ingredient through Plant Breeding and Processing* (Michaels et al.)
- d. **Event updates**
 1. Research Planning Meeting (originally set for May 4th): Postponed, date TBD. Potentially in the fall joined with Research Spotlight meeting

2. Updates on short course/workshop (*Appendix 2, pg. 9*); Considering postponing from Sept. offering to fall date combined with Research Planning Meeting and Research Spotlight Meeting
 3. Option to combine 3 events in October/November (4 day event: 2 day workshop, followed by 1 day Research Planning Meeting, followed by 1 day Research Spotlight Meeting)
 - i. Meeting makeup
 1. 2 day workshop: Based on last year's short course feedback, would repeat "Protein Basics" focus but add more material on product formulation; Last year, we held 1 day of presentations and 1 day of formulation/analytical/pilot plant hands-on demonstrations. We plan to modify the format of rotations in 2020 such that attendees can select which rotations to attend i.e. formulation vs. pilot plant tour/demonstration vs. analytical demonstrations (*Refer to Appendix 2 in meeting agenda for Tech Committee discussion around 2019 short course*)
 2. 1 day Research Planning Meeting – industry presenters and reverse pitch session combined with roundtable discussion of research priorities for Center based on industry needs and challenges; includes booths for company members
 3. 1 day Research Spotlight Meeting – Research presenters within and external to PPIC working on cutting edge research within plant proteins space; includes posters session and booths for company members
 4. Order of events is negotiable, although putting the Workshop first was based on IFT format of offering short course prior to conference; We do not necessarily expect a significant difference in attendance between Research Spotlight Meeting and Research Planning Meeting, so expected attendance will not factor into order of these two events
 - ii. Registration will provide option to register for 1, 2, or all events
 - iii. Feedback from committee
 1. Committee consensus that it makes sense to bundle events, especially from the perspective of travel
 2. From a planning perspective, other events going on in October/November to be aware of are Food and Ag Ideas Week (plans to hold this in October), MEA week, and the NIZO conference; PPIC Team will work to find a week with the least overlap and will consider pushing into November if October is too busy a time
 3. Yui: Want to make sure we showcase the work PPIC is doing, highlighting research outcomes then being able to apply this knowledge in the workshop; this ensures we have a way to translate and execute knowledge gained from research outcomes
 - a. Pam: In Research Spotlight Meeting, we present results of research projects; but also in short course, students will present research work, which will be incorporated into the hands-on demonstration; will be showcasing Center work throughout all three PPIC events
- e. Updates on efforts (by Tech Committee and Exec Board members) to recruit new members:** Announcing new members Danone (Partner), Bay State Milling (1 Year Trial

Associate Member), and EverGrain (Associate Member). **Total of 15 members as of today -- that was the goal for the first year of PPIC!**

1. Gabriela will follow-up with MycoTechnology week of 5/11
 2. John Sheehy (Coperion) reached to Wajira and Lolly individually regarding PPIC
 - i. Pam and Amy met with John week of 4/27
 - ii. Jason and Lolly meeting with John week of 5/4
 - iii. Lolly has an additional contact in Engineering at Coperion
 3. Clint will reach out to contact at Givaudan
 4. Yui will reach out to IFF -- partner with DuPont
- f. Updates on conversations with other companies and potential members** (“Exec Board Shared Resources Document” in Google Drive)
1. Amy covered most recent conversations since last meeting: Spring Theory (Blue Diamond), Meatless Farm Co., Minn-Dak Growers, Coperion K-Tron, First Choice Ingredients, Aveka Group, Oriya Organics, Calyxt, Ciranda (Please see “Exec Board Shared Resources Document” for details on conversations)
 2. Unsuccessful in connecting thus far with flavor houses (Givaudan, Firmenich)

4) Review Proposals

*Additional comments/revisions not discussed during this meeting can be found in the evaluation rubric

a. Goal: Fund 3 proposals

b. Reminder on how the evaluation process will proceed (*Appendix 4 in meeting agenda*)

- No ad-hoc reviewers were invited this round
- Technical Committee has had two weeks to review proposals and fill out the rubric, keeping in mind priority areas – provided tentative vote
- During today’s discussion, committee members will provide final vote
- Encourage Technical Committee to provide feedback and mold proposals to suit what you think is best; we are not typical funding agency, we are a consortium with ability to modify proposals to fit the needs of Center and members
- Your comments and votes will be shared with Exec Board so they can review and make final funding decisions

c. Comments on review process/evaluation rubric

- We have sufficient funds for 3 proposals
- Lolly: Post-meeting, would like to discuss way to make scoring more efficient, less time-consuming; would be helpful for PPIC to cover the portion of making sure all parts of proposal have been provided and appropriate formatting has been followed to better streamline the review process; Pam: yes, this is something the PPIC can handle on their end
- Gabriela: Trouble with answering sufficient funds/leveraging funds question – not always clear in proposals whether leveraged funds are available. Pam: some PIs put leveraging of funds directly in budget and some did not; It is a criterion that we would like to see leveraging of funds, but not all people mentioned this in their proposal
- Clint: Prioritized other criterion over using credentials and publication history as a distinguishing factor in scoring; Pam: PIs produce bio-sketches so reviewers can determine whether or not PIs have appropriate expertise to carry out research, but you can choose whether or not to use this criterion

- Gary: At times had trouble with lining up criteria in RFP with rubric – would like there to be more of a parallel between criteria in RFP and the way the evaluation criteria were laid out
- Pam: we will add to agenda next meeting to review evaluation rubric/make changes

d. Discussion on individual proposals

"High-protein mung bean for potential food applications: protein structure-function relationship and ingredient characteristics" (Buddhi et al.) (49/65 points)

- Carrie ("No" Vote): Mung bean has proven functional capability in space; From aspect of breeding and growing and value chain, is this the right geography for this research? Do we have a market for this in terms of byproduct supply and product outcomes of this research?
- Clint ("No, submit next round"): Looking at bigger picture, mung bean has more baggage in terms of IP, which would limit its application; JUST, Inc. has very broad IP privileges granted, which makes application difficult
- Seyhun ("No"): Quite a lot of current work in manufacturing of mung bean; did not see much innovation on proteins side of this project
- Lolly ("Yes, with revisions"): In general, liked project – more research on mung bean would be beneficial, but did not score in top 3; had more questions than revision requests
- Pam had concerns about ability for project to be done in 1 year (large project scope)
- Wajira ("No") (collective response from protein ingredients team at Ingredion): This proposal scored lowest among proposals for Ingredion team. Weak justification, not very innovative, already commercial products available with mung bean protein on market – could not understand where fundamental knowledge or commercial value would be increased
- Steve ("Yes"): had not previously thought about IP privileges – this would limit availability of results to be broadly applied – will change his vote to "no"
- Gabriela ("Yes") (collective response from Kellogg's team): Mung bean protein is very functional; applies well to meat analogues and beverages space; plant breeding was highlight – understanding new varieties and corresponding functionality of new varieties
- Lehan ("Yes"): not present for response
- Gary ("Yes, with revisions"): Needs revisions, minimally. Had some problems with objectives/how they were written, questioned novelty of project, large project with insufficient funds without proper leveraging of funds
- Yui ("Yes") (collective response from Danone team): really liked aspect of learning more about functionality in selecting the right varieties; it is difficult to find functional plant proteins; mung bean is known to be functional, yet there is a very limited supply with how it is processed; unsure if available in North America, which would give cause to promoting further research. Proposal was vague and confusing in the way it was written. Aware of IP issues – would like to know opportunities where we can bypass IP issues.
- Sara ("No"): Concerns on much this work is needed right now

"Enhancing pennycress oilseeds as a new protein source by improving flavor and protein extractability" (Marks et al.) (51.6/65 points)

Breeding for protein quality

- Where is pennycress in terms of domestication? Pam: early stages, but pennycress is fairly easy to do selective breeding on with quick turnover – faster advances; while breeding for

development, they are also breeding for food use (i.e. removing erucic acid from oil and glucosinolates from meal, producing functional protein)

- Clint: Would it give us hope as to whether or not breeding efforts could revise crop lines pretty early on with functionality attributes?
 - Yes, especially with pennycress; successful in short period of time to produce line with zero erucic acid and in reducing glucosinolate levels;
 - Definitely different from canola protein
- Clint (“Yes”): Next-generation plant that could potentially yield valuable protein; Objective of selectively breeding for lines without antinutrients and superior functionality are aligned with PPIC objectives
- Steve (“No, submit next round”): Concern with length of time that it will take to have an impact on industry with reference to canola protein – struggle to bring canola protein to market despite canola being established crop and in high supply; feels like “next generation canola”, yet canola protein is not yet been fully established in marketplace
- Seyhun (“No, submit next round”): How do breeding efforts change nutritional quality of protein?; Could this be done in parallel?
 - Yes, we have another project funded by Healthy Foods Healthy Lives to look at nutritional quality of pennycress
- Gabriela (“No, submit next round”): Prioritized other proposals given team’s concern over ability of protein to come into market and be utilized

“Developing high throughput methods to predict pea protein functionality and accelerate the breeding of new varieties” (Mulkey et al.) (50.9/65 points)

Develop high-throughput assessment of protein profile

Breeders have 100s-1000s of lines they want analyzed while protein labs can only handle a couple dozen samples for tedious biochemical assays

NIR method calibrated based on biochemistry methods

- Seyhun (“Yes”): Important to find way to quickly screen different lines for how they behave differently functionally
- Wajira (“No” – changing to “No, submit next round”): Concerns:
 - It seems dependent on output of Ismail et al. proposal.
 - Pam: if Pam goes ahead with her proposal, would be able to supply samples for calibration; could be done in tandem with Ismail et al. proposal but is not dependent on it.
 - Methods and process inadequate in detail to promote primary objective to develop an NIR calibration method
- Gary (“No, submit next round”): Per reasons already discussed
- Lolly (“No, submit next round”): Had specific questions that were recorded in rubric
- Gabriela (“No, submit next round”): Per reasons already discussed

“Impact of pea storage protein fractions and their ratio on functionality and nutritional quality” (Ismail et al.) (57.6/65 points)

Characterizing protein profile within pea and trying to determine which protein profile/what ratio of globulin proteins will give better functionality and nutrition to feed back to breeders to inform breeding decisions

- Wajira (“Yes, with revisions”): Needs clarification on the following
 - Types of proteins to be separated– no indication of glutelins or prolamins

- Pam: These are very minimally present; main functional proteins are vicilin, convicilin, and legumin, and then there is albumin (will focus on these proteins for this particular grant)
- Comment regarding use of NIR to screen for pre-accessions; dependent on Mulkey proposal?
 - Pam: This is a comment to indicate that these samples can be used as standards for Mulkey et al. proposal, but is not a requirement/objective of this proposal

"Flavor reactions with plant proteins" (Reineccius et al.) (56.2/65)

Interactions among pea proteins with flavors to understand covalent interactions. Once we understand these interactions, we can potentially mitigate flavor losses in a product

- Sara (“Yes”) (collective GMI response): very excited about this proposal; Is there any work engaging flavor houses in this area/are there any efforts being duplicated?
 - Flavor industry intent is to mask off-flavors – not addressing the source of the off-flavors
- Yui (“No”):
 - Clear the way they want to characterize these interactions
 - Work focuses on covalently bound compounds – what about other compounds? What about other non-volatile compounds?
 - Gary: Flavors interact with proteins in many ways, but covalent interactions are permanent and continue to react for prolonged period and are largely implicated in cause of off-flavors
 - Is this already known in flavor industry through proprietary knowledge?
 - Gary: flavor houses do not have an idea of what is going on from a cause and effect standpoint and work to mask the flavor vs. address the cause of the off-flavors
 - Concern over how long it will take to actually improve plant protein flavor once we know the suspect interactions
 - Are we equipped at this point to identify/quantify at low threshold the compounds that are driving negative off-flavors?
 - Gary: This proposal is aimed at that; we have been working with beta-lactoglobulin and we want to be able to develop methods for plant proteins based on our current methodology
 - Yui: Are you going to pick “worst” protein to represent worst case scenario? Depending on where/how protein is extracted/processed, they can have wide variety of off-flavors/aromas, some easier to mask than others
 - Gary: approach of this proposal is to develop methods; we will be looking at total reaction view, and also specific protein-flavor interactions
 - Gabriela (“No, submit next round”): Covalent bonding is specific to certain flavor compounds; what is the value with regards to a greater flavor profile?
 - Gary: Yes, covalent bonding is specific to certain classes of compounds, but these classes of compounds are what are heavily and broadly used in industry (i.e. lemon, cinnamon, almond); output will cover majority of flavorings used in industry

"Understanding and modulating aroma, appearance, and color of grilled plant-protein-based meat analogues" (Ubbink et al.) (55.7/65 points)

Grilling aspects of plant protein patties; how does grilling impact flavor components and sensory perception; no work done in this area; comparing to grilling of regular meat; using flavor precursors (amino acids, sugars) to see if we can develop certain flavors in grilled plant protein patty

- Steve ("No") Feels product-development oriented, does not fit well within pre-competitive consortium – aimed more at individual companies who want to develop as their own technology to be able to differentiate their products
- Clint ("No") Agrees with Steve; feels like a very narrow focus in plant-based space; does not have as high an impact relative to other proposals; is this the appropriate cooking method/what is predominant cooking behavior for these patties? Consider for usefulness of application
- Seyhun ("Yes") Can we look into intermediate products as additional sampling point to understand chain of reaction during grilling using these different novel proteins
- Yui ("Yes, with revisions"; will change vote to "No, submit next round"): would rather focus more on proposals that address fundamental challenges; sees the benefit in meat alternatives but would rather save for future given need of fundamental knowledge first
- Lolly ("Yes") – Having something that is more than just fundamental research could be additional draw for industry to PPIC
- Gabriela ("Yes"): will have significant impact to industry in meat analogue space
- Carrie ("Yes, with revisions"): Attractiveness to other potential partners given industry interest in meat analogues; has revisions on experimental plan listed in rubric
- Wajira ("Yes"): may be useful for better understanding down the road on flavor aspects of plant proteins; important regardless of limitations recorded in rubric

5) Post-Meeting Action Items

- a. RFP Next Steps
 - i) Amy will compile votes, comments, and revisions from Technical Committee into a summary document and disseminate to the Technical Committee and Executive Board Members
 - ii) Executive Board will make final funding decisions (Exec Board meeting is 5/12/20)
 - iii) PPIC Team will notify PIs of funding decisions
- b. PPIC will obtain quarter 3 reports on the two PPIC projects funded starting in 2019 and share with Technical Committee; Quarter 3 reports are due 6/10
- c. Company Follow-Ups
 - i) Gabriela – MycoTechnology
 - ii) Lolly/Jason – Coperion
 - iii) Clint – Givaudan
 - iv) Yui – IFF/DuPont
 - v) Pam and Amy will continue to follow up with those listed in Exec Board Shared Resources Document
- d. Evaluation rubric revisions: The PPIC team welcomes feedback on how to improve the evaluation rubric; we will add this as an item of discussion to next Technical Committee meeting agenda
- e. PPIC team will begin planning for 4-day comprehensive event in October/November
- f. Discuss new ideas that the partners would like the PPIC to implement – we ran out of time to discuss this in present meeting; this will be added as item of discussion to next Technical Committee meeting agenda