AEIC 2026 Spring Meeting Minutes

P.L. Hunst, AEIC Secretary

Spring Meeting, April 22-23, 2026

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April 22-23, 2026

Washington, DC

P.L. Hunst, Secretary

The AEIC Spring 2026 Meeting was held on April 22-23 and was hosted by USDA in Washington, DC. There were approximately 19 in-person attendees and 27 virtual attendees. Tao Geng, AEIC Past President, welcomed everyone to the meeting and presided over the attendee introductions following the antitrust reminder.

AEIC BUSINESS MEETING

Organizational Updates: Rong Wang (Bayer) was appointed to the office of President by the AEIC Board to finish out Matt Cheever's President term as Matt was elected as the Treasurer.

Approval of 2025 Fall Meeting Minutes (P. Hunst): A motion was made and seconded to approve the minutes posted on the website. Motion was approved by member vote.

Treasurer Report (M. Cheever): Matt Cheever transitioned into the Treasurer position. Records were transferred to Google drive. The Stripe credit card processing was transferred to Matt. Matt and Chris Ament were added as cosigners to the bank account which resides at a local bank in Madison, WI. Dues invoices were prepared and sent out to members.

The Treasurer presented the 2026 budget and current expenditures as follows:

	Planned	Actual
Beginning Balance as of January 1, 2026	$ 41,314	$ 41,314
2026 Membership Dues Received	$ 14,200	$ 8,750
Meeting registration fees - Spring Meeting	$ 5,500	$ 4,410
Meeting registration fees - Fall Meeting	$ 5,500	$ -
Total Projected Revenue	**$ 25,200**	**$ 13,160**
Expenditures		
Scientific Paper	$ 3,000	
DE Franchise Tax Report - Report generation fees	$ 25	$ 30
ANSI/ISO Initiative (AOCS - ISO TAG)	$ 2,900	$ 2,900
Board Meeting Expenses	$ 1,000	
Spring Meeting Expenses*	$ 7,750	$ 4,424
Website hosting, maintenance, security	$ 1,000	$ 444
Credit card processing and bank service charges	$ 1,000	$ 354
Fall Meeting Expenses*	$ 7,750	
Graphic design material creation	-	-
Marketing	-	-
Subscriptions – conferences	-	-
Miscellaneous	-	-
Total Projected Expenses	**$ 24,425**	**$ 8,152**
PROJECTED BALANCE	**$ 42,089**	**$ 46,322**

A motion was made, seconded and voted positive to accept 2026 budget update.

Membership Update (M. Cheever): The Treasurer updated the group on the current membership as follows:

AEIC 2026 Member Summary						Updated: 4/20/2026
		Potential Dues	Paid	Amount Paid	Unpaid	Amount Unpaid
Large Corporate Members (1,000+ employees)	**6**	$6,000	4	$4,000	2	$2,000
Medium Corporate Members (50 to <1000 employees)	**9**	$4,500	4	$2,000	5	$2,500
Small Company Members (< 50 employees)	**12**	$3,000	9	$2,250	3	$750
Associate Members	**3**	$150	2	$100	1	$50
Individual Members	**6**	$600	4	$400	2	$200
TOTAL	**36**	$14,250	23	$8,750	13	$5,500

Fall Meeting 2026: EPL will host the meeting at the University of Illinois (Champaign-Urbana, IL). Corteva will host the 2027 Spring Meeting (Des Moines, IA); EnviroLogix will host the 2027 Fall Meeting (Portland, ME); Bayer will host the 2028 Spring Meeting (St. Louis, MO).

Suggested topics:

- Metabolomics as a regulatory tool (Follow up from 2026 Spring Meeting)
- Polymers for use in purifying membrane and other intractable proteins
- Strategy to compete with China in new technologies
- Protein structure and aggregation
- Germ imaging
- ZoomAgri testing;
- Biologics – Pivot Bio
- non-traditional crops such as GM eucalyptus, sugarcane, orange
- invite Brazil organizations and companies to present (B. Schafer);
- HB4 wheat in U.S.

Working Groups – Updates:

Composition WG: WG group has shown that Kjeldahl and Dumas protein methods correlate in corn and soybean forage samples. Data can be used as basis to argue for the use of Dumas in regulatory studies. The group also considered all the analytes

being tested for in compositional analyses and came up with a list of 61 which was narrowed down to 23 analytes that could be excluded from composition analysis but decided to continue measuring them for now, taking a diplomatic approach by testing regulatory acceptance and sharing feedback among companies to refine their strategy.

Nucleic Acid WG: Group formed in 2021 with goals of producing educational materials, digital PCR manuscript, discuss proficiency and reference materials and explore topic of ambiguous results. All are being worked on. The nucleic acid working group discussed forming a new work stream to address ambiguous results in both DNA and protein analysis and identified the need to appoint leads for this initiative. Group chairs invite anyone interested by contacting Shofi Islam (Indiana Crop Assn) or James Haudenshield.

Protein WG: The group has produced 5 papers in 5 years, The PWG currently has 5 active work streams (Multiplex Validation, MS for Protein quantification, Allergen Analysis, Extraction Efficiency, Intractable Proteins/Characterization). The goal of the **Protein Characterization WS (formerly Intractable Protein WS)** An update on the protein characterization work stream, noted the group's focus on reviewing technologies for protein characterization, production, and quantification, and their goal to standardize measures and harmonize endpoints for GM crop protein safety assessment. The two main projects are: protein structure modeling using AI tools for protein characterization and safety assessment, and glycoprotein characterization, with Pei-Ying Wu (BASF) leading the glycoprotein project. The **allergen analysis group** is developing a publication on best practices for human serum studies, emphasizing a weight of evidence approach before conducting human serology screening. Group is also reviewing EFSA publication: Novel strategies for predicting allergenicity. The group discussed the possibility of forming a new technical working group to address broader questions related to the EFSA explanatory note on protein expression, including mass spectrometry and antibodies. The **multiplex validation** is finalizing a final draft of a manuscript on guidelines for submission. It is currently being reviewed for management and legals and will hopefully be approved in Q2/2026. Kristen K. was asked about the manuscript's focus, clarifying that it centers on analytical tool validation and standardization, not safety assessment advocacy. Concerns were raised about potential misalignment in legal guidance from different companies during manuscript review, and the group discussed mediating such issues within AEIC. The **MS protein quantification group.** The mass spectrometry work stream shifted its focus from protein quantitation to trait protein characterization, aiming to align industry practices using mass spec techniques. The **extraction efficiency WS** is discussing methodologies for establishing extraction efficiency. The whitepaper was published on the AEIC website.

Chris A. will step down as a PWG co-chair since he was elected as the next AEIC VP. There are 4 candidates being considered for PWG co-chair.

Website WG: Use of Google drive is restricted by most companies. Group will revisit Microsoft tools. The nucleic acid working group completed 41 slides for educational

materials on genome editing, led by Ray S. and Sherry W. The genome editing slide deck was completed, reviewed internally by BASF and BR experts, and submitted to the website group for posting. Permission was sought to include a Corteva slide in the genome editing slide deck; if not granted, the deck will proceed with 41 slides. Donna reported that the gene editing training slide deck was received and is being reviewed for minor typos. The group discussed the potential value of sharing AEIC media on LinkedIn and other professional platforms, and the need to assign maintenance responsibilities, this is a long-term commitment and would require daily maintenance. The AEIC website is managed by the AEIC Secretary and a webmaster and is not suitable for collaborative document storage or workspace functions

Industry Associations Updates:

ISO Groups (M. Sussman, USDA): TC 34/SC 16 is the molecular biomarker group which was established in 2008. They have looked at a method for the detection of DNA in cotton fiber used for textile production. Also working on biobanking for germplasm. SC 09 is the microbiology group.

ISBR 2025 (T. Geng, Corteva): The International Society for Biosafety Research had 300+ attendees – regulators and stakeholders in Ghent, Belgium. The next meeting will be held in Bali, Indonesia in Q4 2027.

EFSA Workshop on Protein Safety Assessment (Y. Wang, Bayer): Workshops started in 2017. Updates on new regulatory requirements for protein quantification studies, highlighting increased demands for data transparency, standardized reporting, and justification of method criteria were presented. Regulators now require detailed information on sample collection, method validation, performance criteria, and false positive/negative rates, with a shift from flexible approaches to strict data-driven standards. Increased regulatory scrutiny is requiring detailed data, method-specific analyses, and justification for extraction efficiency and protein quantification studies.

The AEIC Business Meeting was adjourned.

INVITED TALKS

Biotechnology at the U.S. Dept. of Agriculture (J. Rowland, USDA OCE): USDA is one of the ten largest agencies in the government. It consists of partner agencies such as ARS, BRS, APHIS, FAS, FSIS. USDA priorities include increasing farmer profitability; ag genome to phenome initiative; and plant breeding and biotech. USDA supports biotechnology from basic research through regulation, commercialization, production, labeling, promotion, and trade, involving multiple agencies such as APHIS, AMS, ARS, ERS, NASS, NIFA, FSIS, and FAS. USDA's five research priority areas for 2026: increasing profitability for farmers and ranchers, expanding markets and new uses for U.S. agricultural products, protecting agriculture from invasive species, promoting soil health, and improving human health through precision nutrition and food quality. One example is USDA-funded research on covercress, a genome-edited pennycress plant, which is

nearing commercialization and offers improved oil production and soil protection as a cover crop. U.S. farmers have widely adopted genetically engineered soybeans, corn, and cotton since the late 1990s, with these crops accounting for about 30% of agricultural export value, totaling $51 billion in 2025. There were many challenges in developing biotechnology crops in the 1990s, including limited genome sequencing, expensive development, and complex regulatory systems, which led to a focus on commodity crops with herbicide tolerance and pest resistance traits. The U.S. uses the Coordinated Framework for the Regulation of Biotechnology, involving USDA, EPA, and FDA, which allows each agency to regulate biotechnology products under their own authorities without an overarching GMO law. The Coordinated Framework supports innovation, protects health and the environment, and promotes trust, with agencies coordinating responsibilities and sharing information but making independent regulatory decisions. The US coordinated framework for biotechnology regulation has been effective for both traditional transgenic and genome edited products, with FDA and EPA providing streamlined processes for certain products. USDA Marketing covers the bioengineered food labeling law. Genetically engineered crops are cultivated and traded worldwide, with 17 million farmers in 29 countries growing transgenic crops and over 70 countries importing them, according to FAS data from 2018. Genome editing is beginning to be applied to animals, with Japan approving genome edited fish and the FDA authorizing genome edited cattle and pigs for food production. Genome editing enables faster and more precise changes in organisms compared to conventional breeding, and many countries are adjusting their regulations to treat some genome edited products differently from GMOs. Several countries have carved out genome edited products from GMO laws, while others are still considering changes, and some treat all lab-made edits as GMOs. Europe is close to implementing new laws for genome edited products, which will exempt certain edits but continue to regulate herbicide tolerance traits as GMOs. Over 400 gene-edited plants have undergone regulatory consultation and were determined not to be GMOs, with commercial examples emerging in several countries. BRS previously tested large language models for literature reviews in risk assessments but found limited benefit; future improvements are possible.AI tools, such as co-pilot, have only recently been used in regulatory processes, with ongoing internal discussions about future AI applications. More information about USDA can be obtained by contacting Jen (Jennifer.Rowland@usda.gov).

USDA Crop Improvement and Biotechnology (J. Okamuro, USDA ARS): Jack is the Program Lead for Plant Biology at USDA. USDA ARS mission and research priorities, include increasing farmer profitability, expanding markets, protecting agriculture from invasive species, promoting soil health, and improving human health through precision nutrition. The ARS (Agricultural Research Services) is one of four agencies engaged in research, education and economics. ARS has 600 research projects across 15 national programs. The National Plant Germplasm System (NPGS) has a role in acquiring, maintaining, and distributing plant genetic resources, with over 200 crops and nearly 17,000 species represented, and 230,000 distributions annually. Crop wild relatives are important sources of new trait genes for disease resistance, drought tolerance and insect resistance. Diversity sustains modern crop improvement. There has been

successful use of germplasm resources in breeding programs for maize, rice, peanut, and pecan, resulting in valuable new genes for crop improvement. The development and use of crop genetic and genomic databases, such as Maize GDB, provide genome sequences, trait mapping, and functional annotations, and are AI-ready for research and breeding. Artificial intelligence is used in USDA ARS databases to predict protein structures, analyze DNA sequences, and identify beneficial mutations for breeding. The adoption and use of USDA ARS databases and AI tools are increasing, with ongoing efforts to enhance interoperability across systems. The National Plant Genome Initiative, launched in the late 1980s, fostered data sharing and collaboration among USDA, DOE, NSF, and university scientists to advance genomics and gene function analysis. Screening of wheat and wheat wild relatives in the NPGS for resistance genes has been done resulting in 4,000 hits and mapping 519 resistance genes across 41 species, with over 100 wheat R genes cloned and validated since 2015. The "Genome Engineers at ARS" (GEARS) initiative aims to advance genome engineering and precision breeding in challenging crops like tree fruits. USDA has created crop vulnerability statements for 44 crops or commodity groups, which guide ARS research roadmaps based on stakeholder priorities for disease resistance, quality traits, and nutrition. ARS is developing cross-cutting research strategies involving all researchers working on a crop, rather than within individual national programs. Feedback from industry and university colleagues is needed to improve USDA ARS databases and research tools, emphasizing the importance of stakeholder engagement for future agricultural innovation.

Charting the Future of Biotechnology: Insights from the National Security Commission on Energing Biotechnology (J. Beddor, NSCEB): Jennifer Beddor was introduced as the policy and legislative director for the National Security Commission on Emerging Biotechnology, with experience in science and technology policy and engineering. The Commission was started by Congress in 2022 to look at biotechnology with national security. The Commission is made up of 11 commissioners which include Congress Members. The commission's broad definition of national security, includes economic, food, farm, health, and energy security, and its focus is on actionable, implementable policy recommendations. The convergence of biotechnology, gene editing, CRISPR, and AI, predict a major inflection point where biotech will become more integrated into everyday life. The commission found China is advancing rapidly in biotechnology through a coordinated, long-term government strategy, raising concerns about market manipulation and national security. The commission recommended a federal investment of $15 billion over five years to maintain U.S. leadership in biotechnology, warning that delayed action could require much greater future investment. The commission's keystone recommendation is to create a national biotechnology coordination office at the White House, which would oversee strategy and regulation across federal agencies. Recommendations have been made to build more pilot scale infrastructure in the United States to support biotech commercialization and protect intellectual property. The United States lacks sufficient AI-ready biological data and recommended modernizing federal biological data and increasing automated lab capacity to generate new data. The Commission recommends modernization to make Federal biological data AI-ready. 17 commission recommendations were incorporated

into last year's National Defense Authorization Act, primarily focused on defense and intelligence. It is import to pass the National Biotechnology Initiative Act, describing it as the most impactful policy recommendation for advancing U.S. biotechnology. The commissioners conducted a Roadshow Across America, visiting 19 states to highlight local biotech initiatives and encourage federal support. The Commission published three new discussion papers, including updates on federal science modernization, U.S. biotech competition, and regulatory streamlining, with 83 detailed policy options for agencies.

Metabolomics for GMO Safety: Right Tool, Wrong Job? (A. Raychaudhuri,Bayer): Group was divided into two groups to discuss a shared technical viewpoint; identify scientific and analytical gaps; use of new technology for risk assessment. the historical use of targeted metabolic analysis for GMO safety assessment, noting its robustness and adherence to international guidelines. Ani highlighted recent regulatory trends, including EFSA's push for metabolomics as a data requirement, and contrasted this with pragmatic approaches in the U.S., Argentina, and Canada. A discussion on assessing metabolite changes in GMOs compared to non-GMOs was done, focusing on the complexity and variability of biological pathways. The challenge of identifying intended and unintended metabolic changes resulting from gene insertion in GMOs. The need for large datasets to analyze metabolomics data and address complex questions in GMO safety assessment was discussed. Participants agreed that metabolomics is valuable for discovery but faces significant challenges for use in risk assessment due to data noise and lack of correlation with phenotypes.
It was highlighted that environmental factors and production management strategies significantly affect plant metabolic pathways, complicating metabolomics data interpretation for risk assessment. Participants identified technical hurdles in metabolomics, including noisy data, lack of standardized methods, and difficulty interpreting results for risk assessment purposes. Participants suggested that a working group could be formed to develop approaches for addressing technical challenges in metabolomics, with further discussions planned during lunch.

Seed Testing (T. West, AOCS): The American Oil Chemist Society, has a 117-year history as a member-run scientific society with 4,000 members across 90 countries, focusing on fats, oils, soaps, and detergents. AOCS's certified reference materials program, has 87 ISO-accredited products (21 DNA, 66 powders) and 5 new products in development. The laboratory proficiency program, includes 37 series with recent additions of avocado oil and lecithin, and its role in testing for contaminants and advanced instrumentation was highlighted. It was announced that the launch of a biotechnology laboratory proficiency program, with corn and soybean matrices, supporting DNA molecular assays and protein-based lateral flow strip methods, and two testing rounds planned for summer and December 2026. It was explained that the new laboratory proficiency program will initially use a manual reporting process due to software limitations, but may consider an online system if participants prefer it in the future. The possibility of adding stacked products to the proficiency program was discussed and input from participants to guide future program development was welcomed. The proficiency program data is not currently made public, but they are open to considering public access if

participants express a need for it. The use of contract laboratories to prepare and distribute proficiency testing samples for their biotech programs was described. The current certified reference material (CRM) framework is based on trade provider needs, and new CRM projects can be initiated for commodities not currently in the catalog by coordinating with Zoe at AOCS.

EFSA Explanatory Note on Protein Exprression (Y. Wang, Bayer): An overview of the 2018 EFSA explanatory note on newly expressed proteins, highlighting its goal to harmonize risk assessment methodologies and allow applicants flexibility in choosing protein quantification methods was presented. The main requirements of the 2018 EFSA note, includes extraction efficiency validation, detailed reporting of validation parameters, and documentation of all processes in study reports. It was reported that EFSA identified inconsistencies and recurring questions in applications over seven years, leading to the decision to update and clarify the explanatory note to address new technologies and harmonize interpretations. It was outlined that the updated EFSA note, to be implemented in 2026, will include more detailed requirements for sample handling, validation, data generation, and reporting, and will make certain expectations mandatory rather than optional. The highlighted ongoing challenges, including repeated questions from EFSA about sample identity, stability, and extraction efficiency, and noted the need for more standardized approaches to address these issues. The operational and strategic impacts of EFSA's updated requirements, include increased method planning, documentation, and proactive risk identification It was explained that EFSA's questions are increasingly protein-specific and require tailored approaches for extraction, validation, and performance assessment. It was noted the effectiveness of previous extraction efficiency work streams, referencing the generation of a white paper shared with EFSA. It was confirmed that the extraction efficiency white paper was scientifically justified, but EFSA did not fully accept the methodologies proposed. Participants discussed the challenges of combining ELISA and Western blot methods for extraction efficiency, noting mixed signals from EFSA regarding scientific validity and regulatory acceptance.

Regulatory Reset: Changes to USDA Regulations and Process Improvement (S. Chaluvadi, USDA BRS): In 2025, USDA APHIS moved from Riverdale, MD to Beltsville, MD. BRS resumed regulatory operations within 17 days after the Secure Rule was vacated, reinstated permitting and petition processes, and realigned systems to legacy regulations. BRS staff decreased from 81 to 61 in 2025, leading to branch restructuring and increased workload per person; hiring resumed in North Carolina and Fort Collins, CO. An overview of regulatory and non-regulatory processes, including the "Am I Regulated?" process for stakeholders to confirm regulatory status of genetically modified organisms was given. Authorization options for regulated articles, including permits, notifications, and the petition process for deregulation based on plant pest risk assessment were outlined. It was explained that the AIR (Am I regulated?) process is a voluntary, non-regulatory pathway for stakeholders to confirm whether their genetically engineered organisms are regulated, with determinations based on scientific facts and phylogenetic status rather than risk assessment. It was reported that the revised AIR

guide clarified information requirements for submissions, recommended methods for confirming absence of plant pest sequences, and included administrative updates. AIR submissions increased after reinstatement in 2025, with 69 determinations made that year and 25 in 2026, and the average review time decreased to 53 days in 2026 due to more complex cases. Most AIR submissions involved genome edited crops (81%), with a growing trend of developing genetically engineered crops without plant pest sequences, and 13% were transgenic in nature. It was noted that AIR applications were primarily submitted by small and medium enterprises and public institutions, with only Genome edited crops are increasing in prevalence and will differ from traditional GMOs, but transgenic GMOs will continue to be important for certain traits like insect resistance. In 2025-2026, 17 petitions were received, with two determinations completed and eight published for public comment, and the petition process is becoming as popular as the RSR program. An increase in petition submissions from small and medium-sized enterprises and public organizations was noted, with 25% and 19% of applications respectively, indicating broader participation in the reinstated petition process. The petition process for genetically modified plants now requires applicants to provide detailed information on plant biology, genetic modifications, intended and plausible phenotypes, curated experimental data, and field test results. Executive Audiovisual Services described that USDA no longer conducts NEPA environmental risk assessments during deregulation, focusing solely on plant pest risk analysis and publishing only two Federal Register notices, which reduced the regulatory timeline from 15 months to 6 months. It was clarified that the plant pest risk assessment is comparative, evaluating the modified plant against a comparator plant to determine risk, rather than assessing hazard alone. It was highlighted that certain genetic modifications may increase resistance to one disease but also increase susceptibility to others, emphasizing the need to review these characteristics in risk assessments. Plant pest risk assessments require data on direct and indirect risks, including disease susceptibility, effects on non-target organisms, and increased weediness. The use of problem formulation to identify pathways to harm and determine necessary data for plant pest risk assessments, emphasizing targeted data submission based on modification type was described. Petition review timelines have improved, with the first determination completed within 180 days, and the goal is to achieve a 128-day timeframe for future petitions. The focus for 2026 is on improving internal petition review efficiencies by identifying bottlenecks and clarifying information needs for petitioners. The petition review process is being improved for greater efficiency, with strategies to clarify information needs for petitioners and address bottlenecks. The reinstatement and update of the notification process, including new e-file features and streamlined criteria for low-risk organisms, with most notifications acknowledged within regulatory time frames. A proposed efficiency rule was described to restore multi-year and multi-location permits, extend deregulation to all transformation events using the same MOA, and exempt EPA-registered pesticidal plants from USDA review. In 2025, 880 permits were issued, including 713 for plants, with notable increases in microbial and invertebrate permit requests. More information: www.aphis.usda.gov/contact.biotehnology; www.aphis.usda.gov/biotechnology.

Global Biotechnology Regulations: Overview and Role of American Seed Trade Association (A. Gutdche, Corteva): ASTA is one of the oldest U.S. trade organizations (established in 1883), representing over 650 members with a focus on plant breeding and seed production. Most ASTA members are small businesses, making the organization diverse and representative of various industry interests. ASTA's mission is to advocate for policy environments that support innovation, resilient agriculture, and economic growth for the farm sector. ASTA represents members at international, national, and state levels, including collaboration with the U.S. government on trade agreements to improve seed movement. The seed industry is a capital- and knowledge-intensive sector, emphasizing research investment and intellectual property protection, similar to technology companies. Seed producers face challenges similar to farmers, including labor shortages, rising costs, weather events, and regulatory changes, which can impact seed availability and global movement. Global seed production involves multiple stages across different countries, with seeds often crossing several borders before reaching their final destination. Seed and grain trade is complex, with a need to manage 80 tariff codes and over 100 export markets, and the importance of barcoding and tracking throughout production. Regulations affect seed producers, such as variety registration, seed purity laws, phytosanitary requirements, environmental and liability laws, seed treatment regulations, and food/feed laws. Technology-specific regulations, such as those for biotechnology and gene editing, are layered on top of general seed regulations, and ASTA advocates for the industry on these issues. ASTA now leads advocacy for both transgenic biotechnology and genome editing policy after BIO shifted its focus to pharmaceuticals and medical biotech. ASTA collaborates with domestic and international partners, including grower groups, grain associations, plant breeders, and the CropLife Network, to develop consistent policies for intellectual property and plant breeding innovation.
Plant breeding has evolved with specialized tools, including mutagenesis, transgenes, and genome editing, to increase genetic diversity and improve crop traits. Transparent, science-driven, and risk-proportionate regulatory frameworks to accelerate seed variety development and avoid unnecessary burdens are needed. ASTA has advocated for international regulatory alignment and modernization to facilitate global movement of grain and seed and support innovation.
Genome editing has democratized technology access, enabling participation from academics, institutions, small and medium-sized entities, and large companies. Gene-edited crops have expanding diversity, including fruit, trees, horticultural crops, flowers, vegetables, and hemp, with some already commercialized. Genome-edited crops often lack clear traits, resulting in broader genetic modifications and combinations, which will require new regulatory and analytical approaches. Event-specific detection methods are no longer required for many genome-edited crops, and traceability may shift from analytical detection to process-based or paper tracking methods. Countries like Argentina distinguish genome edited crops from GMOs by defining GMOs as organisms with novel combinations of genetic sequences, allowing genome edited crops using DNA from within the gene pool to be regulated differently. Argentina was the first country to use its GMO legal definition to exclude certain genome edited crops, allowing those using only DNA from within the gene pool to be regulated differently from GMOs.

AI: Delivering Real World Seed Imprivement (J. Swigert, Gro Alliance): Gro Alliance was founded in 1941 and has evolved from dairy and hog production to a third-party seed supply chain solutions provider with multiple US and Chile locations. Gro Alliance is implementing AI solutions at their vegetable seed improvement center in Davis, California. SeedX uses advanced imaging and AI to sort seeds by capturing individual images and analyzing each seed for quality and genetic purity. Each seed is imaged, taking 10,000 measurements, and then seeds are classified based on germination and quality standards. Users can set germination standards, adjusting the threshold to determine how many seeds to keep or discard, optimizing for desired outcomes. The SeedX machine has been used successfully for tomato and pepper crops, with global data enabling immediate sorting for many varieties without retraining the AI. The SeedX machine's database updates automatically from worldwide usage, improving accuracy and adapting quickly as technology advances. The SeedX machine receives remote updates, enabling it to sort new crops like peppers without additional training. Experiments are ongoing with watermelon seed production companies to improve productivity and reduce labor costs using automated sorting. The SeedX machine's slow processing speed currently limits its use to high-value vegetable crops, but future improvements may allow sorting of larger crops like corn and wheat. The SeedX machine can sort out difficult seed types, such as "fish mouth" seeds in cucumbers and peppers, which traditional sorters cannot handle. The SeedX machine is being used for sorting grass seed mixtures in seed testing labs, potentially reducing manual labor and improving accuracy. The SeedX machine eliminated GMO contamination from a popcorn seed lot by distinguishing dent corn from popcorn based on subtle physical differences. Machine adaptations are needed for round seeds like soybean which roll off belt, There are 10 machines globally which are learning from each other. Gro Alliance has innovation partnerships, including with BioLumic for UV seed treatment, ZCal for GMO traits, and SeedX for AI-powered seed sorting and genetic purity improvement.

Genetic Alteration of Pigs for Human Therapeutic Applications (J. Bianchi, United Therapeutics): John described their work at Revivacor in Blacksburg, Virginia, focusing on genetically edited pigs for therapeutic and food applications. The facility has a long history of creating unique genetically engineered animal lines, including cloning the first cow and pigs. The Blacksburg facility's capabilities, include a 900-acre research farm, biosecure breeding and surgical facilities, and a staff of 30 experts in molecular and cell biology. The process for pigs is to start with a pig cell line; perform genetic manipulations; sort cells; genotype; sequence to confirm intended/unintended changes. Cell line is then used in somatic cell transfer to produce litter of pigs which are tested for intended change and are then bred. Gal-Safe pigs have the alpha-gal (alpha 1,3 galactose) turned off by inserting 6 human genes and knocking out 3 pig genes. Humans do not have AG but have remnants of gene and produce antibodies to it. If human with antibodies exposed to meat containing AG will have an anaphylactic response, AG syndrome in humans is caused by the Lonestar tick bite so it is a public health concern. Animals have AG but do not produce antibodies to it. The regulatory approval process for the gal-safe pig, included joint FDA and USDA

review, use of USDA-inspected abattoirs, and the introduction of a "no Ag" label to indicate the absence of alpha-gal. Regulatory discussions are led by engineers, with scientists providing technical answers when needed, facilitating dialogue with regulators. Therapeutic uses of animal biotechnology, include biologics (viable cells/organs) and non-biologics (inactivated cells, medical devices, pharmaceuticals) The creation of the gal-safe pig is done by inactivating the GGTA1 gene using homologous recombination, eliminating alpha-gal expression. Humans produce antibodies to alpha-gal due to the inactivation of the GGTA1 gene, leading to hyperacute rejection of pig organs in transplantation. Animal biotechnology could provide a novel source of organs for human transplantation to address the shortage and overcome antibody-mediated hyperacute rejection. The gal-safe pig was developed by inserting PPL657 into the GGTA1 gene, resulting in a pig without alpha-gal, and that the lineage has been sustained since 2000 through breeding and analytical testing. Gal-safe pigs showed no increased vulnerability to disease compared to standard pigs, with mechanical and immunological testing results consistent between both types. Patients with pig-derived organ transplants are not more susceptible to African swine fever virus due to pig cells, but are generally more susceptible to pathogens because of immunocompromised status.
Variability in alpha-gal sensitivity across different food animal species varies, noting that some individuals react to certain animals but not others. Alpha-gal syndrome symptoms can range from rashes and anaphylaxis to GI distress and cardiovascular disease, sometimes only discovered after severe events. Analytical tests, including histology, immunoblot, and ELISA, showed no detectable alpha-gal in gal-safe pig tissues, while standard pigs exhibited alpha-gal presence.

USDA ARS Efforts to Support US Agriculture: Gene Banks, Disease Resistance Discovery and Characterization (J. Okamuro, USDA ARS): Biotech needs include disease/pest resistance; nitrogen use efficiency, drought tolerance and temperature resilience. Rice needs breeding and technology for elevated night temperatures which affect yield and quality. Markers have been identified for wheat R genes with 100 genes identified from 41 species. Biotech can lead to knowledge-based breeding. Advantages of genome editing in crop breeding, include preserving breeder gains, expanding gene pool access, and enabling rapid trait transfer across breeding programs.
New genome editing technologies allow engineering plants without tissue culture, streamlining the process for breeders. Conventional breeding and genome editing technologies are being used to remove celiac and wheat-dependent exercise-induced anaphylaxis antigens from wheat, aiming for products with improved health and resistance traits. USDA ARS is domesticating the wheat dwarf India virus as a new vector to accelerate genome editing in crop plants. The process of clustering resistance genes on a single chromosome using genome editing simplifies marker selection for breeders. Recent progress in cloning resistance genes for wheat stem rust (SR69), Hessian fly (H26A, H26B), and green bug (GB34) were mentioned, with upcoming publications, Resistance genes H26A, H26B, and GB34 for wheat stem rust and green bug have been recently cloned, with H26A and H26B soon to be published. Almonds, previously considered resistant to plum pox virus, can harbor the virus and transmit it to plums or peaches via aphids, posing a threat to US industries. A participant

described ongoing efforts to create breeder lines with durable resistance to diseases and pests, enabling breeders to introduce desired traits for growers. Genome editing is being used in grapevine to enhance berry color, flavor, and vine architecture, with promising initial results. Hypoallergenic and celiac-safe wheat lines have been tested for bread-making quality and are within conventional wheat limits, with adoption by breeders depending on market demand.

USDA ARS Appalachian Fruit Research Station (C. Dardick, USDA ARS): The station is located in Kearneysville, WV and has 500 acres of fruit orchards, The genetic improvement program is stakeholder-driven, emphasizing innovation, new variety releases through conventional breeding and biotechnology, and solutions to critical diseases and value-added traits. The biotechnology program has developed functional transformation systems for apple, pear, plum, grapes, and recently sweet cherry, aiming to solve production problems using available tools. The integration of conventional breeding and biotechnology for stone fruit improvement was described, emphasizing priorities such as tree architecture, dormancy, and fruit quality. The identification and use of architecture genes, such as TAC1, is used to develop high-density, compact tree varieties for improved productivity in crops like peach, plum, and poplar. The architecture genes are highly transferable across plant species, enabling breeders to optimize traits like height, branching, and leaf density in both field crops and trees. Results from poplar field trials, showed that gene editing increased leaf composition from 35% to over 47% and achieved a 500% increase in leaf production per acre using high-density, compact types. There are ongoing efforts to stack additional traits, such as high-density trichomes and biochemical pathway modifications, to enhance bioproduct and biomolecule yields in poplar. There is a collaboration with Pairwise to develop pitless cherries, a project initiated in the early 2000s. There are ongoing efforts to identify and map genes responsible for the stoneless trait in plums, aiming to transfer candidate genes to cherries for pitless fruit development. Successful transformation and gene editing systems have been developed for sweet cherry, enabling further biotechnology applications in woody fruit crops. Work is being done to manipulate dormancy genes in peaches and plums to desynchronize bloom periods, potentially extending bloom and overcoming frost, while highlighting the need for synchronized fruit development for efficient harvest.

USDA ARS Apple Pre-Breeding Program (C. Gottschalk, USD ARS):
USDA ARS apple pre-breeding program, focuses on introducing new genetic diversity and durable disease resistance to address challenges not solved by academic or private breeding programs. The apple pre-breeding program aims to provide new germplasm material to national breeding programs, especially to address issues like genetic uniformity and region-specific challenges such as high heat and humidity. Excessive genetic uniformity in apples, particularly due to widespread use of Honeycrisp, poses risks for disease susceptibility and storage disorders, emphasizing the need for increased genetic diversity. There are challenges to breeding tree fruit, especially apples and pears, due to high heterozygosity and the need to manage diverse traits such as color in pears. Chris Gutsche highlighted the use of the USDA

apple germplasm collection and the development of genomic resources, including reference genomes and bioinformatic tools, to better utilize wild and underutilized apple species. USDA has implemented a rapid cycle breeding system using transgenic lines, such as T1190, to accelerate apple breeding and reduce generation times from decades to a few years. The vision for the "percolate" project is to integrate rapid cycle breeding, pan-genome resources, and germplasm repositories to harness wild crop diversity and accelerate breeding timelines. The breeding scheme for rapid cycle apple, involved hybridization with wild species, backcrossing, and genotyping to create seed lots for efficient germplasm storage and distribution. There is ongoing work to develop rapid cycle breeding systems in pear, having had successful flowering observed in transgenic lines and plans to build a matching program to the apple model within the next two years. In contrast thedevelopment of the Gold Rush apple required six generations of crosses over nearly 50 years to introduce apple scab resistance from wild relatives. A pre-breeding program combining fire blight and apple scab resistance with Honeycrisp traits, resulted in new populations AFRS 42, 43, and 44. The team identified *Malus fusca* as a source of strong fire blight resistance and began hybridizing it with advanced breeding lines to pyramid resistance genes. Copy number variation of candidate resistance genes in *Malus fusca* and other apple genomes was found to correlate with fire blight susceptibility. Current validation of breeding material relies on PCR-based methods, but DNA extraction from tree fruit remains a technical challenges. There are challenges with DNA extraction from tree fruit due to co-precipitants interfering with PCR and sequencing, emphasizing the need for pure DNA for efficient testing. The use of short read sequencing and mapping was described to reference genomes and vectors to detect transgene presence and insertion location, highlighting the use of the TC Hunter program for analysis. Adoption of long read sequencing technologies, such as Oxford Nanopore, is used to identify transgene insertion sites and improve annotation, with initial success in cherry and ongoing efforts in apple. Implementation of high-throughput target capture and multiplexed sequencing using Twist products was described enabling rapid genotyping of large sample sets and collaboration with other groups for alternative arrays. There are challenges of balancing consumer traits like taste with disease resistance in apple breeding. Consumer panel studies are conducted for pears and could be applied to apples once regulatory petitions are approved.

Registrants for Spring 2026 Meeting:

Name	Organization
Ament, Chris	Eurofins FCT
Avalos-Ochoa, Daniela	Iowa State University
Balvin, Kevin	SGS NA
Bednarcik, Mark	Syngenta
Brix, Kalyn	SoDak Labs
Cheever, Matt	BASF
Collum, Richard	Corteva
Deege, Lora	Corteva
Engbrecht, John	Corteva
Geng, Tao	Corteva
Gillikin, Nancy	BASF
Haudenshield, James	Individual
Houchins, Donna	Romer Labs
Hunst, Penny	Individual
Islam, Shofiqul	Indiana Crop Assn.
Johnson, Brenda	Eurofins BDI
Joshi, Saurabh	BASF
Kenward, Kim	20/20 Seed Labs
Kouba, Kristen	Corteva
Lange, Phil	Syngenta
Liu, Zi Lucy	Bayer
Makani, Mildred	Syngenta
McKinnon, Lucas	Bayer
Rangarajan, Sneha	Kemp Proteins
Raychaudhuri, Aniruddha	Bayer
Samake, Seydou	USDA
Saracco, Scott	Bayer
Savithri, Purayannur	Syngenta
Scaife, Ann	Eurofins FCT
Schafer, Barry	Schafer Scientific
Serelis, Zoe	AOCS
Shippar, Jeff	Eurofins FCT

Simon, Garrison	Romer Labs
Sondeno, Rachael	OMIC USA
Spiegelhalter, Frank	Eurofins GS
Sussman, Michael	USDA
Travis, Brady	Syngenta
Umthun, Angie	Individual
Wang, Rong	Bayer
Wang, Yanfei	Bayer
Wang, Yongcheng	Bayer
Watkins, Crystal	EPL BAS
Weigel, Scott	3CR Bioscience
West, Tiffanie	AOCS
Whitt, Sherry	BASF
Wu, Pei-Ying	BASF
Yau,Kerrm	Corteva
Zhang, John	Corteva