



# Midwest Poultry Consortium

## Mission Statement

The Midwest Poultry Consortium is organized to provide leadership, support and resources for poultry education and research in member states.

**Strategies.** Strategies, established in 1995 by the initial MPC Board of Directors, are continuously improved to meet the needs of the poultry industry and provide the foundation on which decisions are made.

**Leadership.** Support, maintain and enhance poultry science education and research at member state universities.

**Education.** Encourage students to enter the field of poultry.

**Research.** Increase basic and applied research in poultry and food science at member state universities.

**Communication.** Facilitate communication, coordination and interaction between industry, universities, government and interested public.

Following a two-year pilot program with the University of Florida and the Florida Poultry Federation, the MPC Board of Directors accepted Florida as a full member state in July, 2006. This created cross-country collaboration providing additional resources for the Center of Excellence Scholarship Program.



Participating States

## Harkin Receives 2008 Outstanding Service Award



Sen. Tom Harkin (IA)  
2008 Recipient

Senator Tom Harkin of Iowa was awarded the Midwest Poultry Consortium's Outstanding Service Award for his dedication and commitment to the poultry industry. Senator Harkin, who serves on the Ag Appropriations Committee, has been a strong and longtime supporter of the Midwest Poultry Research Program (MFRP). Senator Harkin and his staff have requested funding for the program on MPC's behalf and recognize its importance to both Iowa and the poultry industry as a whole. Iowa continues to lead the nation in egg production. Harkin is particularly impressed by the cash match commitment the industry makes to the program and feels strongly that the MPRP should be viewed as a model of how other grant programs should be structured. For his past and continuing support and willingness to include the MPRP in his requests to the Ag Appropriations Committee, MPC was proud to honor Senator Tom Harkin as the 2008 Outstanding Service Award winner. Senator Harkin joins past recipients, Dr. Wendy Wintersteen (Iowa State University), Dennis Casey (Hy-Line International), Sue Lamont (Iowa State University), Ron Kean (University of Wisconsin-Madison), Bob Sparboe (Sparboe Companies), and Congressman Tom Latham (IA). *Congratulations Senator Harkin!*

## Midwest Poultry Consortium Unveils New Sections of the Website!

In an effort to remain a leading resource for poultry information for both industry and students, the Midwest Poultry Consortium launched a new section of its website at [www.mwpoultry.org/COEhome.html](http://www.mwpoultry.org/COEhome.html).

The new COE section of the MPC website offers students a wealth of information regarding the COE experience and valuable information about the poultry industry through our MPC member companies. The new section is filled with important information regarding COE summer classes/syllabi, Coordinating Council contact information for each university, an events calendar, and an internship & job information page. In addition, MPC has enabled online application to make applying for COE easier. Students are able to simply complete their application form, upload their resume and statement of interest, and submit to MPC.



# MPC Board of Directors

## Chair

**David Hurd - Egg**  
Rose Acre Farms

## Vice Chair

**Larry Barnett - Turkey**  
Land O'Lakes Purina Feed

## Secretary

**Nita Nurmi - Egg**  
Sparboe Companies

## Treasurer

**Pat Solheid - Turkey**  
Jennie - O Turkey Store

**Steve Anders - Egg**  
Hy-Line International

**Gary Cooper - Turkey**  
Cooper Farms

**John Fagan - Allied**  
Chore-Time, an EPS Division

**Bill Garr - Allied**  
Hy-Line International

**Ed Garrett - Turkey**  
West Liberty Foods

**Steve George - Egg**  
Fremont Farms of Iowa

**Gordy Gingras - Allied**  
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**Tim Johnson - Turkey**  
Willmar Poultry Company

**Steve Jurek - Broiler**  
Gold'n Plump

**Alan Koch - Allied**  
Henning Construction

**Kevin Roberson - Egg**  
Michael Foods

**Phil Sonstegard - Egg**  
Sonstegard Foods

**Mike Turk - Other species**  
Maple Leaf Farms

**Lou Arrington - Ex Officio**  
Midwest Poultry Federation

## The newly updated COE website features:

**Coordinating Council Page.** This page provides an excellent resource for students to find the COE representative contact from their university. Coordinating Council members can serve as faculty references for COE applicants.

**Event Calendar Page.** The event calendar lists Career Fairs MPC attends and COE happenings.

**Updated Internship & Job Page.** Students and graduates can find a list of all MPC member companies, by sector, to explore companies of interest. With links to company websites, students will also be able to connect to employment pages of MPC member companies for an easier job search process.

Just one click away, the new MPC sections of the website make learning about the COE and potential employment opportunities easier and faster. Check it out today - [www.mwpoultry.org](http://www.mwpoultry.org)!

## Consortium Holds Annual Meeting - March 18

MPC's Annual Meeting was held Tuesday, March 18, 2008, in conjunction with the Midwest Poultry Federation Convention in St. Paul, MN. The Annual Meeting opened with Chairman David Hurd welcoming those in attendance and introducing MPC President Beth Nelson for a review of the past year's events, including MPC's budget status, the current status of the Center of Excellence Scholarship Program (COE) (a record-breaking 57 applications were received for the 2008 summer sessions) and the Midwest Poultry Research Program (\$506,000 was awarded for fiscal year 2008).

The Secretary's report was given by Nita Nurmi and the Treasurer's report by Chairman Hurd standing in for MPC Treasurer Pat Solheid. The Nominating Committee report was given by Chairman Hurd and was subsequently agreed to and approved by the membership (see board list to the left).

MPC's Annual Meeting featured three guest speakers. Dr. Frank Kooistra, Associate Dean for Administration at the University of Wisconsin-Madison, spoke about the University's plans to update its poultry facilities and its continuing commitment to the COE. COE students, Kelsey Campbell and Morgan Sonstegard, spoke about the COE and the benefits it provides to both students and industry while at school and upon graduation. Campbell and Sonstegard briefed participants about the day-to-day activities of students in the program, the lifetime friendships which are formed, and the career benefits the scholarship program and internships offer students.

That evening, Lou Arrington hosted a Hospitality Suite during the MPF Convention, for former and current COE students. Students were given the opportunity to meet with faculty and network with one another and other poultry industry representatives.

## MPC Visits Capitol Hill to Secure 2009 MPRP Funding

Efforts to secure 2009 funding for the Midwest Poultry Research Program (MPRP) was a priority as representatives of the Midwest Poultry Consortium traveled to Washington, D.C., to meet with Congressional staff. Representatives met with Congressional staff members of both the House and Senate Agricultural Appropriations Committee to review the mission of the current program, the types of research it addresses, and to stress the need for continued funding. The MPRP continues to be well received in Washington due in large part to the significant cash match the poultry industry contributes to the program.

## MPC Staff

**Beth Nelson**, President  
**Alyssa Andrews**, Student Recruiter  
**Jon Dockter**, Associate Director  
**Jenna Knoblauch**, Student Director  
**Janet Osebold**, IT Specialist  
**Kelsey Campbell**, Intern

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# COE Center of Excellence Scholarship/Internship Program

As the Midwest Poultry Consortium's Center of Excellence (COE) Scholarship Program enters its 14th year, the COE continues to educate students in poultry science and helps ensure the availability of qualified poultry graduates for employment within the industry.

The COE is unique in guiding students through recruitment, education, internship, employment and networking opportunities in the poultry industry. The program brings together key faculty from participating universities and the foremost private industry experts, offering the strongest research-based poultry science education available in MPC member states. This program combines problem solving and state-of-the-art hands-on training in laboratory situations, interactive classroom lectures and field trips for up to 32 scholarship recipients each year. Student scholarships include on-campus housing and up to 18 credits, which are earned in two six-week summer sessions. These courses complement a number of majors and credits are transferable to the student's home university. Students are encouraged to participate in industry internships to further their poultry education. MPC strives to continuously improve this program to benefit students and the poultry industry for years to come.

## 2008 SESSION I

### **Avian Physiology**

Murray Bakst, USDA

### **Mary Beck, University of Nebraska-Lincoln**

Mark Berres, University of Wisconsin-Madison

Patricia "Scotti" Hester, Purdue University

Alice Wentworth, University of Wisconsin-Madison

Bernie Wentworth, University of Wisconsin-Madison

### **Breeder Flock & Hatchery Management**

Darryl Barker, Hy-Line International

### **Ron Kean, University of Wisconsin-Madison**

Sally Noll, University of Minnesota

Mike Wineland, North Carolina State University

### **Poultry Products Technology**

Deana Jones, Russell Research Center

Michael Musgrove, Russell Research Center

**Mark Richards, University of Wisconsin-Madison**

## 2008 SESSION II

### **Avian Health**

### **Mark Cook, University of Wisconsin-Madison**

Rob Porter, University of Wisconsin-Madison

### **Poultry Nutrition**

### **Mike Lilburn, The Ohio State University**

Carl Parsons, University of Illinois

### **Poultry Enterprise Management**

Allen Behl, Behl Turkey Farms

Chad Gregory, United Egg Producers

### **Darrin Karcher, Michigan State University**

### **Ken Koelkebeck, University of Illinois**

Keith Kulow, Daybreak Foods

Wendi Lallier, MacFarlane Pheasants

Jeremy Lies, Gold'n Plump

Brad Lillie, MacFarlane Pheasants

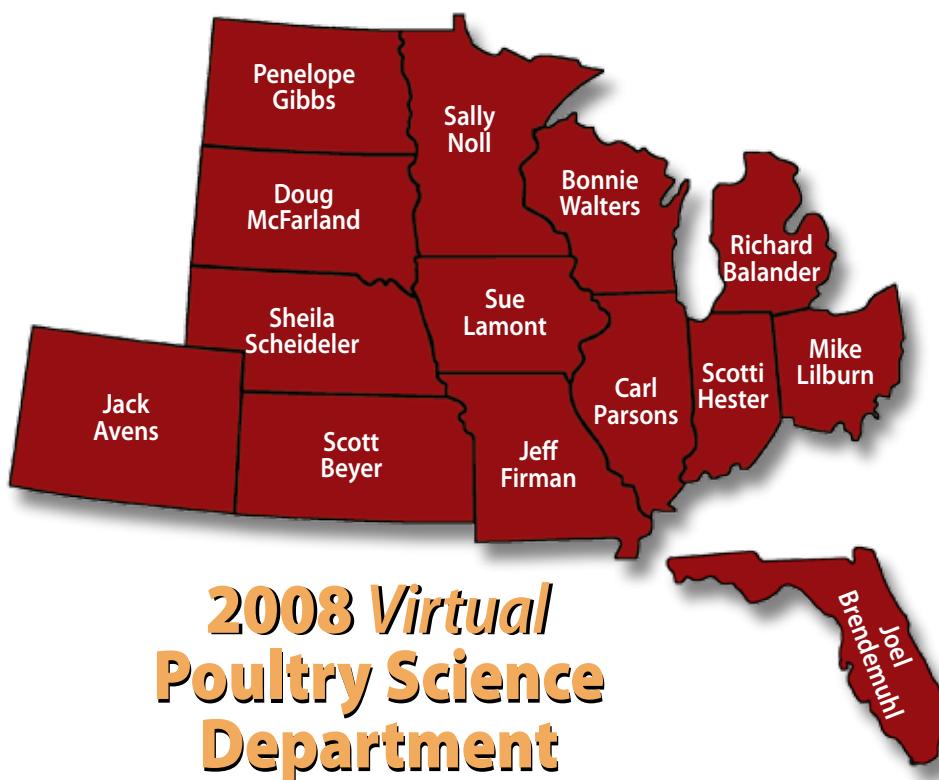
Tom Lohr, Henning Construction

Kevin Murdoch, Maple Leaf Farms

Neil O'Sullivan, Hy-Line International

Chris Roedl, Daybreak Foods

**Course Coordinators indicated in bold type.**



## 2008 Virtual Poultry Science Department

### Wednesday Night Forums

On Wednesday evenings, students are able to interact with industry leaders in order to learn more about the poultry industry and future career opportunities. This year's forums were led by:

**Trudy Baumeister, S & R Egg Farm**  
**Craig Burda, Gold'n Plump**  
**Sara Halvorsen, Gold'n Plump**  
**Carl Heeder, Jennie-O Turkey Store**  
**Jenna Knoblauch, Midwest Poultry Consortium**  
**Bill Petz, Gold'n Plump**  
**Joel Reiman, Hormel Foods**

## Center of Excellence Scholarship Program

The COE program has been gaining momentum throughout the last few years. With record applications in 2006 and record internships in 2007, 2008 continued the record-breaking trend. In 2008, 56 student applications were submitted, 29 scholarships were awarded, with 18 of those students participating in 19 industry internships provided by MPC sponsor companies.

Breakdown of COE Students															
Year	CO	FL	IA	IL	IN	KS	MI	MN	MO	NE	ND	OH	SD	WI	Total Students:
2008	0	2	3	1	4	1	3	3	3	1	1	0	1	6	29*
2007	0	1	3	1	8	2	3	2	1	0	1	1	2	5	30
2006	2	4	4	1	9	1	5	4	0	0	1	1	3	4	39
2005	3	3	4	1	2	0	2	2	0	3	1	1	2	6	30
2004	0	0	2	1	3	2	2	3	0	3	1	2	0	6	25
2003	0	0	2	0	4	2	2	1	0	2	1	4	0	5	23
2002	0	0	3	2	5	3	3	2	0	1	1	2	0	9	31
2001	0	0	1	2	6	4	4	0	0	2	0	1	2	10	32
2000	0	0	1	2	3	3	4	2	0	0	0	3	4	14	36
1999	0	0	1	0	2	0	6	3	0	1	0	2	1	10	26
1998	0	0	0	3	2	2	3	3	0	1	0	3	0	5	22
1997	0	0	1	2	1	2	0	2	0	2	0	5	1	13	29
1996	0	0	0	2	0	2	0	1	2	2	0	2	1	9	21
	5	10	25	18	49	24	37	28	6	18	7	27	17	102	373

\*29 Scholarships were awarded; however, one additional student paid their own way to attend COE classes.

<b>Total COE students completing one year:</b>	<b>252</b>
<b>Total COE students completing program:</b>	<b>121</b>

### Universities Represented in 2008

Augustana College	1
Iowa State University	3
Kansas State University	1
Michigan State University	3
North Dakota State University	1
Purdue University	4
South Dakota State University	0
The Ohio State University	0
University of Florida	2
University of Illinois	1
University of Minnesota – St. Paul	3
University of Missouri	3
University of Nebraska	1
University of Wisconsin – Madison	3
University of Wisconsin – River Falls	3

### 2008 Internships

Many of the MPC member companies provide internships and on-the-job opportunities for COE students. The internships fit the academic timetable for participating universities and complement COE courses.

**Joe Ankley - Rose Acre Farms**  
**James Bailey - Rose Acre Farms**  
**Nick Braun - Gold'n Plump**  
**Kelsey Campbell - Jennie-O Turkey Store**  
**Joe Dart - Gold'n Plump**  
**Megan Dole - Hy-Line International**  
**Nathan King - Jennie-O Turkey Store**  
**Bob Krenz - Gold'n Plump**  
**Maggie Lanigan - Cal-Maine Foods**  
**Lucas Mayfield - Rose Acre Farms**  
**Kathy Mou - Hy-Line International**  
**Truc Nguyen - Centurion Poultry**  
**Dale Perez - MacFarlane Pheasants**  
**Robert Pfund - Sparboe Companies**  
**Stephanie Rasanen - Rose Acre Farms; Cooper Farms**  
**Cristina Romero - Sparboe Companies**  
**Alex Ties - Sparboe Companies**  
**Ben Varley - Rose Acre Farms**

If your company is willing to host a COE student intern, please contact the MPC office.

### COE Receives CHS Foundation Grant

MPC was awarded a grant of \$3,000 from the CHS Foundation to support the activities of the MPC's Center of Excellence Scholarship Program (COE). This was the sixth year of involvement in the Center of Excellence Scholarship Program for the CHS Foundation and demonstrates their dedication and commitment to agriculture and poultry education in our member states. *Thanks CHS Foundation!*

## A "Spellbindin' Good Time"

Celebrating the end of its 13<sup>th</sup> year of providing students an emphasis in poultry science education, the Midwest Poultry Consortium held its year-end banquet and awards ceremony in July at the Madison Concourse Hotel & Governor's Club in Madison, WI. The event, which garnered more than 70 students, family members, staff, board members, faculty and industry representatives, honored both students and faculty for their accomplishments and hard work in completing another successful summer session.



Steve George  
Fremont Farms

The newly themed "Spellbindin' Good Time" Banquet featured a spelling competition which awarded winners the right to either carve their table's turkey or designate another to do so. The banquet provided both students and industry representatives an opportunity become better acquainted and visit about potential employment opportunities within the poultry industry.

Students vote for deserving recipients in three student categories and one faculty category each year. The 2008 awards went to the following students: Alex Ties - class clown (Yolkster Award), William McBride - most dedicated student (Ducks in a Row Award), and Truc Nguyen - most intelligent student (Egghead Award). The Pullet-zer Prize, recognizing the faculty member of the year, was awarded to Bernie Wentworth (UW-Madison).



Pullet-zer Prize Recipient  
Bernie Wentworth

The presentation of diplomas to COE graduates by on-site coordinator Dr. Mark Richards gave well-deserved recognition to students who've completed both years of the COE. 2008 graduates include: James Bailey, Ashley Biller, Nicholas Braun, Joseph Dart, Lando Koch, Meaghan Loy, William McBride, Kathy Mou, Goodwin Sonstegard, Morgan Sonstegard, Alex Ties, and Benjamin Varley. (see photo below). ***Congratulations go to all 2008 COE graduates!***

The evening was capped off by an all new "evening entertainment" addition to the yearend banquet. Robinn Lange, a renowned hypnotist, was on hand to demonstrate the power of hypnosis on willing but apprehensive participants. While those in the audience thoroughly enjoyed the onstage antics, in the end, no one who fell under Robinn's spell embarrassed themselves beyond repair.

The Midwest Poultry Consortium extends very special thanks to our event sponsors Evonik Degussa Corporation, Gold'n Plump, Henning Construction, Hy-Line North America, Jennie-O Turkey Store, Rose Acre Farms, and Sparboe Farms for making the "Spellbindin' Good Time" Banquet such a success.



2008 COE Graduates: Back Row (L to R): Joseph Dart, Bill McBride, Lando Koch. Middle Row (L to R): Goodwin Sonstegard, Nick Braun, Meaghan Loy, Alex Ties, Ben Varley. Front Row (L to R): Morgan Sonstegard, Kathy Mou, Ashley Biller, and James Bailey.

## Students in the News

### Mike Banks, Purdue University

Mike Banks, a 2007 COE graduate, is employed by Purdue University as a graduate research assistant working with Dr. Adeola & Dr. Applegate.

### Nick Braun, Gold'n Plump

Nick Braun, a 2008 COE graduate, is employed by Gold'n Plump as a Broiler Service Representative in St. Cloud, MN.

### Brenda (Shaffer) Elder, Allen's Hatchery

Brenda (Shaffer) Elder, a 2004 COE graduate, is employed by Allen's Hatchery as a Hatchery Manager in Delaware. She manages a broiler hatchery that has 42 incubators with the ability to hatch over 1 million chicks per week.

### Anna Mattson, Webster Veterinary Supply

Anna Mattson, a 2007 COE graduate, is employed by Webster Veterinary Supplies as a Customer Service Representative/Inside Sales in the southeast.

### Bill McBride, S & R Egg Farm

Bill McBride, a 2008 COE graduate, is employed by S & R Egg Farm in a managerial role in Whitewater, Wisconsin.

### Michael Schmidt, Sparboe Companies

Michael Schmidt, a 2001 COE graduate, is employed by Sparboe Companies as a Quality Assurance Manager. He oversees quality assurance relating to food safety, product quality and animal care programs.

### Karen Smiley, Janesville School District

Karen Smiley, a 2003 COE graduate, is employed by the Janesville School District as an agriscience teacher in Janesville, Wisconsin.

### Goody Sonstegard, Ovasur

Goody Sonstegard, a 2006 COE graduate, is employed by Ovo Productos del Sur S. A. in Lima, Peru, as a Product Development & Project Supervisor. He oversees the development/improvement of products, particularly for exportation and supervises/implements plant projects related to production.

## Give Back to the COE Program!

*In your new position, you can help MPC...*

**Be a Wednesday Night Speaker!**

**Host an intern!**

**Hire a COE graduate!**

**Mentor a COE student!**

**Become an MPC sponsor!**

*Contact the MPC office to find out more!*

[www.mwpoultry.org](http://www.mwpoultry.org)  
[mwpoultry@comcast.net](mailto:mwpoultry@comcast.net)

# MPRP Midwest Poultry Research Program

The Midwest Poultry Research Program (MPRP) is a public/private project created to effectively address priority research needs of the poultry industry in MPC member states (Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin).

The goal of MPRP is to improve efficiency and sustainability of poultry production through integrated, collaborative research and technology transfer. MPRP focuses on priority areas of local need and problems of regional/national scope while encouraging multi-disciplinary research networks which enhance limited state and industry resources. Funding for MPRP is distributed competitively in the following manner: 40% for critical industry needs regardless of species or subject area; 20% for broiler research; 20% for turkey research; and 20% for layer research.

Established in 2001, MPRP received an initial appropriation from Congress of \$400,000. Through the 2008 allocation, **MPRP is responsible for contributing more than \$4 million to poultry research efforts.** This program has been extremely successful in addressing some of the most pressing research needs in the poultry industry, renewing interest among students in poultry research and engaging industry in the research taking place at our member universities. MPRP is looked upon very favorably by Congress due to the significant cash match (averaging nearly 40% since inception) on the part of industry, demonstrating a serious commitment and investment in the program.

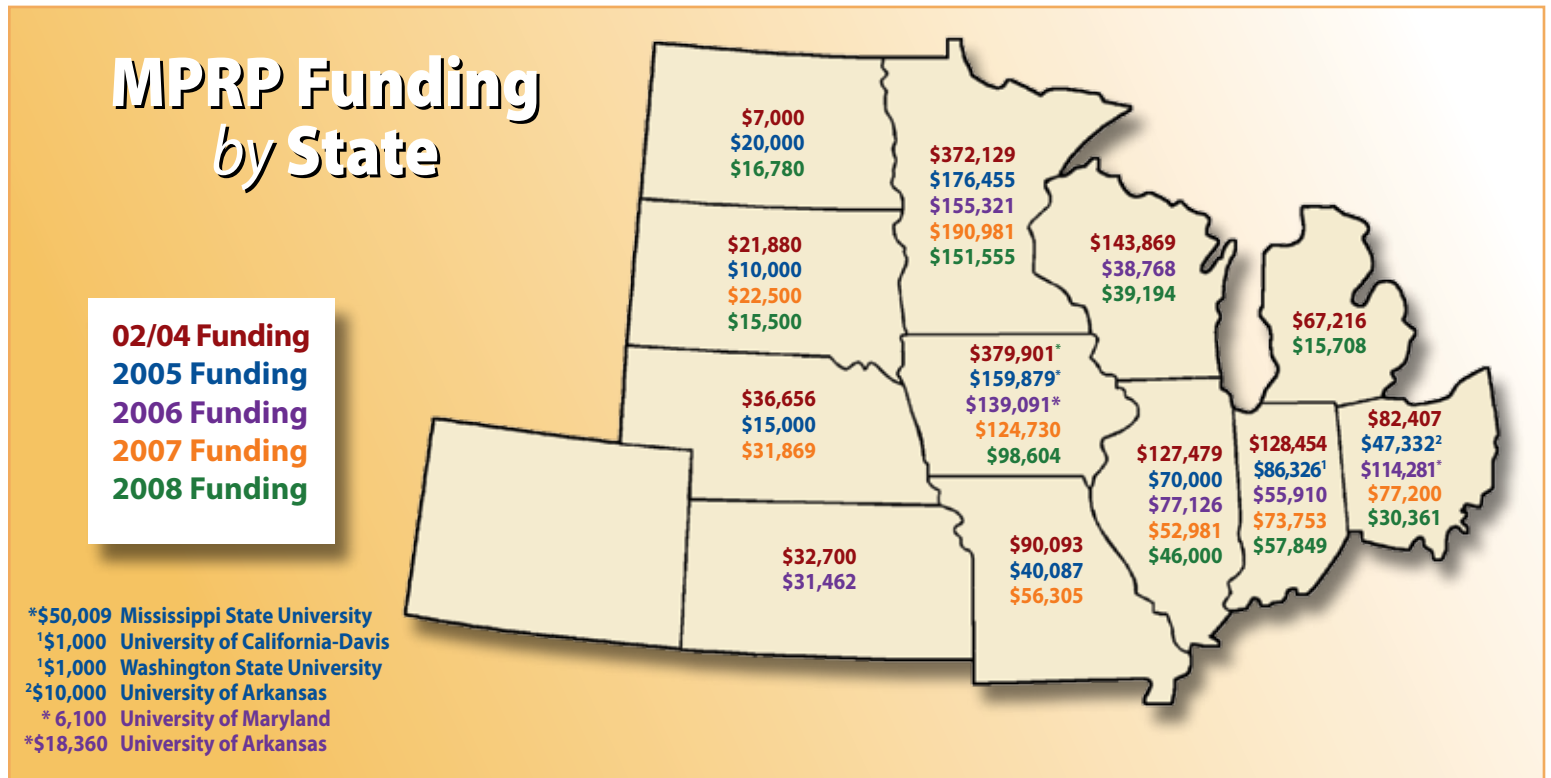
## MPRP Review Committee Meets, Allocates Funding

Each Spring, MPC works closely with the House and Senate Ag Appropriations committees to maintain funding for the Midwest Poultry Research Program (MPRP) established in 2001 to address the research needs of the poultry industry in MPC member states.

Through those efforts, the MPRP was appropriated \$506,000 for FY08. After USDA overhead and administrative costs were removed, the MPRP had \$428,551 to distribute to research projects. In late December, a Request for Proposals was distributed which generated a total of 22 projects representing 8 of the 14 land grant universities in the Consortium, requesting a total of \$885,343. The Review Committee, which met in St. Paul on March 18 to allocate funding, had very difficult decisions to make, but ultimately awarded funding to 12 projects.

## 2008 MPRP Review Committee

- Bernie Beckman, Hy-Line North America**
- Jacque Jacob, University of Minnesota**
- Brian McComb, Jennie-O Turkey Store**
- Hugo Medina, Sparboe Companies**
- Ralph Mikelson, Gold'n Plump**
- Curtis Novak, Land O'Lakes**
- Carl Parsons, University of Illinois**
- Shiela Scheideler, University of Nebraska**
- Chris Theisen, MacFarlane Pheasants**
- Mike Turk, Maple Leaf Farms**
- Sandra Velleman, Ohio State University**
- Terry Wehrkamp, Cooper Farms**



<b>Cash Match Contributors</b>	<b>2002-2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>Total</b>
ADM Company			11,250			\$11,250
Ajinomoto Heartland	10,000			30,000		\$40,000
Animal & Poultry Waste Management Consortium	13,534					\$13,534
Arkion Life Sciences	25,500					\$25,500
Agricultural Utilization Research Institute (AURI)				20,000		\$20,000
Aviagen	60,000	17,500				\$77,500
BASF				10,000		\$10,000
Commodity Specialists Company/Midwest Dist. Assn.			9,567			\$9,567
Cooper Farms					2,500	\$2,500
Dakota Commodities	17,500					\$17,500
Dakota Gold Research Association				9,195	5,000	\$14,195
Danisco Animal Nutrition	13,584	10,000				\$23,584
Degussa		10,000	15,000	10,000		\$35,000
Elanco	3,000					\$3,000
General Chemical		5,000				\$5,000
George & Edna Jaap Poultry Research Fund	8,000	5,000	12,500	3,125	3,125	\$31,750
Heartland Lysine		10,000				\$10,000
Hy-Line International	10,571		21,980	6,500		\$39,051
ILC Resources			1,365			\$1,365
International Ingredient Corporation		7,500		4,000		\$11,500
Iowa Egg Council		53,505	24,340	50,341	14,035	\$142,221
Iowa State University Funds	43,003					\$43,003
Iowa Turkey Federation	22,400	8,223				\$30,623
JBS United	10,000				15,000	\$25,000
Jennie-O Turkey Store					13,106	\$13,106
Kansas State University Funds	4,950					\$4,950
Land O'Lakes Purina Feed	25,500	12,500	10,000	10,000		\$67,000
Maple Leaf Farms	15,000	14,000	15,142	20,500	7,950	\$72,592
MacFarlane Pheasants, Inc.	5,720	5,000	6,500	6,500		\$23,720
McQuinn Foundation		20,000				\$20,000
Michigan Allied Poultry Industries	1,000					\$1,000
Michigan Corn Marketing Program	3,000					\$3,000
Michigan State University Funds					13,500	\$13,500
Midwest Poultry Consortium			22,064	20,000		\$42,064
Minnesota Turkey Research & Promotion Council	35,263	51,495	36,275	68,914	43,903	\$235,850
Mussehl Poultry Research Endowment	10,000			25,254		\$35,254
Nebraska Poultry Industries		3,000				\$3,000
North American Gamebird Association					4,375	\$4,375
North Dakota State University Funds		4,000				\$4,000
Novus	28,000		16,000			\$44,000
Ohio Poultry Association	2,000	4,900			2,500	\$9,400
Ohio State University Funds			10,814			\$10,814
Ridley Feed Ingredients	5,000					\$5,000
Roche Vitamins Inc.	7,000					\$7,000
South Dakota Poultry Industries Association	3,000			3,125	3,125	\$9,250
Syngenta Animal Nutrition			9,000			\$9,000
United Egg Producers		15,134				\$15,134
University of California - Davis Funds	6,391					\$6,391
University of Minnesota Funds	80,862					\$80,862
University of Missouri Funds	66,950					\$66,950
Univeristy of Wisconsin Funds	32,094					\$32,094
Willmar Poultry Company	10,881	12,225				\$23,106
Zymetrics	14,000					\$14,000
<b>Total</b>	<b>\$602,703</b>	<b>\$268,982</b>	<b>\$221,797</b>	<b>297,454</b>	<b>128,119</b>	<b>\$1,519,055</b>

## 2007 MPRP Project Summaries

**The following summaries are abbreviated versions of the 2007 MPRP reports.**

**Please visit our website for complete reports at:**

**[www.mwpoultry.org](http://www.mwpoultry.org)**

### **Evaluation of Limit Feeding Corn and DDGS in Non-Feed Withdrawal Molt Programs for Laying Hens**

U of IL – Koelkebeck, Parsons

**Project Award:** \$20,000

**Cash Match:** \$10,000 (Purina Mills, Land O'Lakes)

**Summary:** During weeks 1-43, hens fed Corn 36, Corn 45, Corn 54, DDGS 36, DDGS 45, and DDGS 54 diets produced equally as well as those fed the Corn/Soy Hulls treatment. During the molt period, no differences were observed among treatments for mortality except for the DDGS 45 treatment. Throughout postmolt period, no mortality differences were observed among treatments except for the DDGS 36 and DDGS 54 treatments.

During postmolt, the Corn 54 treatment produced the lowest egg weights, no consistent differences were observed among other treatments in comparison to the Corn/Soy Hulls treatment. No differences were observed among dietary treatments for egg specific gravity. Feed efficiency was different for the Corn 36 treatment, but in all other treatments no differences were observed in comparison to Corn/Soy Hulls treatment. Results indicate long term comparable postmolt performance can be obtained by feeding a restricted corn diet or DDGS diet in Hy-Line W-36 laying hens.

### **Varying Length Feeding of Prebiotics and Fiber from DDGS as Replacements for Antibiotic Growth Promoters**

U of IL - Parsons, Baker

**Project Award:** \$32,981

**Cash Match:** \$14,000 (BASF, International Ingredient Corporation)

**Summary:** Results indicate there are several prebiotic treatments that may have beneficial effects on growth performance and intestinal microbial populations and may be able to partially or totally replace AGP. GB had positive effects on MEN and AA digestibility when fed 0-21 days, however, it may not be cost effective. It was interesting and encouraging that short-term feeding of GB for only 3 or 7 days had positive effects on growth/feed intake and cecal microbial populations. Feeding temulose for 0-21 days had positive effects on MEN and amino acid digestibility. This is a relatively inexpensive additive and may be cost effective. Whether short-term feeding of temulose for only 3 or 7 days may be effective is not clear at present and warrants further investigation. Results with the Elusieve fiber were encouraging. Feeding 5% for only a short time (0-3 days) had a positive effect on growth/feed intake. The purpose of the Elusieve process is to produce lower fiber, higher protein and higher fat enhanced DDGS in ethanol plants. Results indicate high fiber fraction removed by the Elusieve process may have potential benefits as a prebiotic and a replacement for AGP.

### **Production of Ovotransferrin From Egg White for Antimicrobial Application**

ISU – Ahn, Lee, Pometto

**Project Award:** \$44,421

**Cash Match:** \$35,201 (Iowa Egg Council)

**Summary:** Most ovotransferrin in the natural egg white exists in apo-form. Thus, conversion of apo-ovotransferrin to iron-bound form was

the most critical step to minimize loss or denaturation of ovotransferrin by ethanol. Amount of iron required to saturate all ovotransferrin in egg white was about two times the theoretical amount to bind all apo-form of ovotransferrin. Holo-ovotransferrin in the presence of excess iron was more stable to ethanol treatment than that at low iron concentrations. At pH 9.0, the iron binding capacity of holo-ovotransferrin was significantly higher than at pH 7.0 or 8.0, and high pH conditions stabilized ovotransferrin during ethanol extraction and precipitation steps. Holo-ovotransferrin could be easily separated from egg white using 43% ethanol extraction and 59% ethanol precipitation. AG<sup>®</sup>1-X<sub>2</sub> ion exchange resin was excellent in removing iron from holo-ovotransferrin and the citrate added to adjust pH played a critical role in iron release from holo-ovotransferrin. Preparation method was simple and economical, and ovotransferrin produced had high purity (> 80% purity) and yield was excellent (99%). Therefore, the protocol developed is appropriate for a large-scale production of ovotransferrin. Produced ovotransferrin is applicable for food products because only ethanol was used to separate ovotransferrin from egg white.

### **Understanding Gallibacterium-Associated Peritonitis in the Commercial Egg Laying Industry**

ISU – Johnson, Nolan, Trampel

**Project Award:** \$53,309

**Cash Match:** \$15,140 (Iowa Egg Council)

**Summary:** Three *G. anatis* genomes were subjected to draft sequencing using the GS FLX technology. Initial assemblies yielded 75-125 contiguous sequences/genome, at an average fold-coverage of 25X-30X, with total estimated genome sizes ranging from 2.5-2.8 Mbp. Gap closure has reduced the number of contigs to <20/genome. These contigs have been annotated and analyzed for pathogen-specific genes. From this analysis, 24 genes were selected for further study. Multiplex PCR and Southern hybridizations were used to examine the prevalence of 24 genes among 100 *G. anatis* isolates collected from commercial layer operations in Iowa over a two-year period. Genes identified as highly prevalent among these isolates included genes of two different ABC transporter systems, possibly involved in iron transport; capsular biosynthesis genes; heme utilization genes; and a putative outer membrane protease. These results provide targets for future work involving study of the virulence mechanisms of *G. anatis* or vaccine development. Multilocus sequence analysis (MLST) of 94 isolates, combined with the genotyping data, revealed that certain clonal types appear to dominate intra-flock, and intra-farm. Also, genotype and clonal type do correlate with one another to at least some degree, since certain MLST clusters tended to be more likely than others to possess a gene or system.

Overall, this project produced the first genome sequences of *G. anatis* implicated in peritonitis in commercial layers. These sequences are powerful tools for future work targeting vaccine candidates with which to control peritonitis in laying hens. Genotyping and MLST schemas is publicly available (<http://www.umn.edu/~joh04207/>), and will be highly useful from a diagnostic perspective. Refinement will result in the ability to effectively predict the virulence capabilities of *G. anatis* isolated from birds or the poultry production environment.

### **Biomarkers to Identify AMPV Vaccines from Field Challenges**

U of MN – Foster

**Project Award:** \$24,610

**Cash Match:** \$8,121 (Minnesota Turkey Research & Promotion Council)

**Summary:** To produce a reverse genetic system for the entire 14.15kb AMPV cDNA, the pBluescript plasmid that contains a T7 promoter was used as the backbone vector. cDNA #1 corresponding to the 1.2 kb N gene and



the 3' leader sequence (0.1 kb) was inserted next to the T7 promoter in the vector. Downstream from this, cDNA #2, a 2.2kb fragment encoding the P and M genes, as well as the 5' portion of the F gene was inserted. cDNA #3, a 3 kb fragment that contains the 3' portion of the F gene plus the M2-1 and SH genes was inserted downstream of cDNA #2. cDNA #4, a 1.8 kb fragment corresponding to the G gene was inserted next and only cDNA #5, which encodes 5kb of the 5' portion of the L gene, remains to be inserted into the vector. The 3' portion of the L gene plus a ribozyme/T7 termination sequence were inserted into the pBluescript vector.

There are 4 other gene constructs needed for co-transfection along with the complete 14.15kb AMPV cDNA above in order to produce infectious virions in the host cell. N (1.2 kb), P (1.0 kb), M2-1 (0.8 kb), and L (6.0 kb) genes were inserted into four different pCITE vectors and the cloning was verified to be correct by sequence analysis.

When the reverse genetic cDNA for 14.15 kb AMPV is completed, this construct plus 4 pCITE vectors containing N, P, M2-1 and L genes, respectively, will be co-transfected into BSR/T7 cells to obtain infectious AMPV.

Three different biomarkers to differentiate biomarker AMPV vaccine from wild type AMPV will be inserted into the 14.15 kb AMPV cDNA in the pBluescript vector. Green Fluorescent Protein (GFP) and 6x Histidine (His) tag will be placed between the N and P genes and will be flanked by the N gene start and end sequences to maintain an ORF to correctly express either the GFP or 6x His peptides. The GFP marker can be detected by fluorescence or by PCR while the 6x His tag can be detected by ELISA or by PCR. A short (50bp) lambda phage DNA sequence will be merely inserted between the N and P genes since no expression is necessary for this marker which will be detected by PCR. Implications for the industry include having different biomarker AMPV vaccines that can readily be detected from wild type AMPV in a relatively short period of time.

### **Development of an Improved Avian Pneumovirus Vaccine Differentiable from Wild Virus**

U of MN – Goyal

**Project Award:** \$52,000

**Cash Match:** \$17,448 (Minnesota Turkey Research & Promotion Council)

**Summary:** When compared to the vaccine progenitor virus MN 1a p9, the vaccine virus p63 and 'ca' virus had more amino acid substitutions than p41. In the case of G gene, p41 had more substitutions than p63 and ca viruses. Amino acid substitutions were observed throughout the genome of MN-2a virus and these substitutions were more in the divergent domain of G gene when compared to MN-1a (p9) virus. The p9, p41, p63, ca, and 2a viruses had the maximum of 42, 40, 40, 42 and 42 bases, respectively, as leader sequences. Part of the trailer region was sequenced using L4IF13816 forward and consensus trailer reverse primer Tr-R for all 5 viruses.

Sequence analysis of different passage levels of G-gene of MN 15a showed no change in length of G-gene as a result of passaging in Vero cells, though at some places, point mutations were observed. N and F genes cloned in rFPV were amplified. Future studies are recommended in turkey poults to determine safety and efficacy of this clone against aMPV.

### **Effect of Thermal Conditioning During the Prebreeder Period on Breeder Hen Turkeys Reproductive Performance**

U of MN – Halawani

**Project Award:** \$26,700

**Cash Match:** \$8,900 (Minnesota Turkey Research & Promotion Council)

**Summary: Gas consumption.** Rooms were heated using natural gas and a preconditioning period from February 21-May 1, 2007. Control room heat

consumption was 240.8 Therms at a cost of \$222.85. Heat consumption of the room housing birds subjected to 75°F at 20 weeks, increased 5°F once every 2 weeks and ended at 95°F when the birds were 29 weeks, was 683.6 Therms at a cost of \$632.53. Gas consumption for preconditioning of birds in the third treatment was 532.9 Therms at a cost of \$493.09. The fourth treatment, which consisted of 3 weeks of preconditioning from 85 °F at 27 weeks to 95 °F at 29 weeks, utilized 485.7 Therms at a cost of \$449.43.

**Egg production.** Egg production of hens that received preconditioning heat treatment for 10 weeks, from 75°F at 20 weeks increasing 5°F every 2 weeks and reaching 95°F at 29 weeks, started to decline at 6 weeks and continued to decline until week 18. Best production was that of hens receiving 3 weeks of heat preconditioning starting at 27 weeks for only 3 weeks. Average egg production was 4.16 eggs/hen/week, during the 27 week production period. Lowest average egg production was hens receiving 10 week period of preconditioning (3.43 eggs/hen/week). Control group average egg production was 3.86 eggs/hen/week during the 27 week production period. Results clearly indicate that heat preconditioning can be beneficial and detrimental to egg production depending on the severity of the preconditioning temperature and the age of the birds at the initiation of treatment.

### **Utilization of Corn Co-Products from the Ethanol Industry in Market Turkey Diets**

U of MN – Noll

**Project Award:** \$27,587

**Cash Match:** \$9,195 (Dakota Gold Research Association)

**Summary:** Corn germ product was slightly lower in protein and fat than anticipated. In contrast to the report by Kim et al. (2008), amino acid digestibility of lysine was similar among co-products and a high energy value for corn germ was not observed.

In the feeding trial, there were few differences of significance among the 11 dietary treatments in body weight, gain, feed intake and feed efficiency up to 14 weeks. After 14 weeks, the major difference was more related to the basal diet series and with the addition of either the CG or HP-DDG. Diet series containing 20% DDGS (Treatments 6-10 average) had a lower level of gain compared to diet series without DDGS (Treatments 1-5 average) for the 14-17 weeks and 17-19 weeks age period. Decreased gain was probably due to the high level of corn protein present in diets especially during the 17-19 week period, where the level of soybean meal was minimal.

There were only 3 treatments which were statistically different from the control. Feed efficiency was only different from the control for 2 treatments where the higher addition level of CG resulted in an improved feed/gain in comparison to the control. Improvement in feed conversion with the CG addition could indicate that energy value of CG was underestimated or that CG contributed a higher quality protein to the diet.

In summary, up to 30% corn germ or 14% HP-DDG could be added to diets composed primarily of corn, soybean meal and poultry byproduct meal. Use of corn germ tended to result in better bird performance. Diets with high levels of protein coming from the addition of various corn co-products to the diets in excess of 60% in the finisher diet resulted in reduced gain.

### **Utilization of Glycerin as a Source of Energy in Market Turkey Diets**

U of MN - Noll

**Project Award:** \$9,747

**Cash Match:** \$29,916 (AURI, Minnesota Turkey Research & Promo. Council)

**Summary:** Nutrient density had ~7 times greater effect on feed conversion as compared to body weight. Glycerin addition to 4% of the diet had

no negative effects on performance. Levels of 6 and 8% tended to be detrimental to body weight and feed intake especially during 17-19 weeks. This negative effect may be due to reduction in corn content in exchange for glycerin or a differential in utilization of different dietary energy sources (carbohydrate vs. fat). Carcass and parts yield was not altered with the exception of yield of wings and abdominal fat.

The study found crude glycerin can be added up to 4% of the diet for grow/finish market turkeys without detrimental effects on performance and was able to replace some corn in the diet as an energy source. On average, 78 lbs of corn/ton could be replaced with 80 lbs glycerin/ton. Supplementation with additional amounts of amino acids (lys, meth, thr) was also needed to replace those amino acids from the corn. Depending on the cost of the corn and the supplemental amino acids relative to glycerin, glycerin has the potential to reduce diet cost in market turkey feeding.

### **Eradication of Avian Metapneumovirus in Turkeys by Inducing Mucosal Immunity with Inactivated Virus**

U of MN - Sharma

**Project Award:** \$50,337

**Cash Match:** \$16,779 (Minnesota Turkey Research & Promotion Council)

**Summary:** Exposure of turkeys to aMPV41 increased the relative proportion of mucosal CD8 T cells. CD8 but not CD4 gene expression was upregulated in turbinates. Upregulation of IL-10 gene expression indicated that the virus stimulated Th2 type immunity.

Previous research has shown poly(I:C) was an effective respiratory adjuvant that enhanced mucosal immune response to aMPV. Also, immunization with IV increased the presence of IgA and IgA+ cells in the respiratory mucosa. Challenge experiments indicated turkeys given three immunizations with IV were protected against challenge with live aMPV41. Vaccination also protected against T cell mitogenic inhibition caused by the virulent virus. Results indicated success in inducing local respiratory immunity by applying killed virus to the respiratory mucous membranes of commercial turkeys lacking anti-aMPV antibodies.

It may be possible to immunize turkeys against aMPV by applying killed virus to the respiratory tract (such as by spray). It has been shown under laboratory conditions that respiratory vaccination with killed aMPV induced local immunity characterized by appearance of antibodies in the mucous membrane and protected turkeys against challenge with virulent aMPV.

### **Digestible Threonine Requirements of Male Turkeys to Market Age**

U of MO - Firman

**Project Award:** \$33,140

**Cash Match:** \$20,000 (Degussa, Ajinomoto)

**Summary:** Seven experiments were conducted to determine the digestible threonine (dThr) requirement of Nicholas male turkeys from 0-21 weeks of age. Each experiment represented 1 phase of the life of the birds, which was divided in a 3 week period. However, the data collection period counts only the last 14 days of the period. The first 7 days, birds stayed on positive control diets. In all seven phases, birds were randomized to floor pens with 8 treatments and 6-7 replicates/treatment.

### **Reduction of Feed Costs Through the Use of Missouri Ideal Turkey Protein**

U of MO - Firman

**Project Award:** \$23,165

**Cash Match:** \$7,750 (Minnesota Turkey Research & Promotion Council)

**Summary:** In a previous trial, the Missouri Ideal Turkey Protein was fed in comparison with an Agristats industry average diet. Minor depressions in

growth were noted in the Ideal ratio diet, that were overcome with 5-10% amino acid additions. Based on these data, this trial was performed similarly, but with minor changes in amino acid levels to reflect Dr. Firman's best estimate of which amino acids were deficient in the original trial. There are no significant differences in performance between any treatments, indicating changes made overcame any minor inaccuracies in the Ideal Ratio for Turkeys. Growth rates are a bit behind due to hot weather near the end of the trial. Significant cost savings are seen with these diets that range from 7-10% for the Ideal diet. No differences were seen in any measures at 18 weeks. At 21 weeks there were no significant differences noted, but numerically lower pectoralis major values were seen in the ideal and ideal +10% diets. This is not believed to be significant.

### **Dried Distillers Grain with Solubles in Pullet and Laying Hen Rations**

U of NE - Scheideler

**Project Award:** \$31,869

**Cash Match:** \$25,254 (Mussehl Poultry Research Endowment)

**Summary:** Feeding up to 25% DDGS during phases I & II of production had no negative effects on feed intake, egg production, haugh unit and specific gravity; and, improved yolk color at the highest levels. Hens fed 20 and 25% DDGS in phase I produced lighter egg weight, whereas, egg weight was not affected in phase II. Using 25% DDGS has an economical benefit of \$12/ton of feed compared to basal diet (0% DDGS) when DDGS was priced at \$136/ton. In summary, feeding DDGS up to 12.5% had no negative effect on body weight, growth rate and feed intake. Body weight, growth rate, and feed intake are comparable to the Hy-Line breeding manual standards.

### **Determining the Digestible Lysine and Lysine:Threonine Ratios for Growing Turkeys**

OSU - Lilburn

**Project Award:** \$28,700

**Cash Match:** \$20,000 (Ajinomoto)

**Summary:** Two diets were formulated containing 0.60% and 1.05% total lysine and blended to achieve 2 intermediate diets containing 0.75% and 0.90% total lysine. All other amino acids were in excess of NRC recommendations by at least 10%. Each diet contained chromic oxide as an indigestible marker and at the time of harvest, ileal digesta was collected from each bird for apparent lysine digestibility determination. Average apparent lysine digestibility estimate for each diet was ~80% which resulted in four digestible lysine concentrations, 0.48%, 0.60%, 0.72%, and 0.84%. Diets were fed to 48 toms from 114-140 days and body weights were equalized across treatments at the start of the study. Each tom was reared individually in litter floor pens. Greatest responses were consistently observed in toms fed 0.72%-0.84% digestible lysine which corresponded to 0.90-1.05% total lysine, considerably higher than 0.84% recommended by Waldroup et al. Across all variables measured (gain, carcass weight, FER, pectoralis major breast muscle), toms fed 0.84% digestible lysine diet consistently had the highest values numerically but these were not significantly different than those fed 0.72% digestible lysine.

In a second series of experiments, diets were formulated containing 2 levels of lysine and multiple levels of threonine. Analyzed levels of lysine and threonine are very close to calculated values. At the time of writing this report, the digestibility coefficients of the diets are still to be determined. At the youngest age period studied, 2-4 weeks, toms were housed individually (n=48) in Petersime growing battery pens. At older ages, toms were reared individually in floor pens with litter.

## Impact of Stocking Density on Growth & Yield of Commercial Pheasants

OSU – Velleman

**Project Award:** \$26,000

**Cash Match:** \$6,500 (MacFarlane Pheasants)

**Summary:** Project explored impact of stocking on the commercial pheasant. The present stocking density 1.8 ft<sup>2</sup>/bird served as the control. From that commercial density, 4 additional densities (1.6, 1.4, 1.2 and 1.0 ft<sup>2</sup>/bird) were established and exposed to a 15 week growth cycle typical of the modern commercial pheasant. Stocking density does not become a factor until some point beyond 12 weeks of age. Prior to that time there were no significant differences between stocking densities. At 15 weeks of age there were clear density differences. Birds reared at 1.2 and 1.0 ft<sup>2</sup>/bird were ~8% lighter than that of 1.8, 1.6 and 1.4 ft<sup>2</sup>/bird which did not differ. This depression in growth also transferred to processed product. In general, there was a clear depression in weight as density decreased from 1.8-1.0 ft<sup>2</sup>/bird. The same observation was made for females.

This research provides clear evidence that the pheasant producer has options to maximize facility efficiency without adding anything to farm infrastructure. Production efficiency is expected to be further improved since processing age will continue to be further reduced in response to selection.

## Ileal Digestibility of Amino Acids in Feeds for White Pekin Ducks

Purdue - Adeola

**Project Award:** \$23,197

**Cash Match:** \$10,000 (Maple Leaf Farms)

**Summary:** Experiment was conducted to determine ileal amino acid digestibility of various ingredients in ducks. A total of 288 White Pekin ducks were used in a 5 day trial to determine apparent ileal amino acid digestibility of various feed ingredients. Six feed ingredients including soybean meal (SBM), meat and bone meal (MBM), canola meal (CM), corn distillers' dried grains with solubles (DDGS), corn, and wheat were used. Feed ingredients served as the sole source of amino acid in semipurified diets composed of dextrose, soy oil, solka floc, minerals and vitamins. Ducks received standard duck starter diets for 13 day post-hatch, and at day 14 were sorted by weight and allocated to 6 dietary treatments in a randomized complete block design. There were 8 replicate cages per treatment and 6 ducks per replicate cage. Beginning from day 14, ducks received the assay diet for 5 days and ileal digesta was collected on day 19. Ileal N digestibility was greatest (P < 0.01) in diet with SBM and the range was 72.4 (MBM)-88.3% (SBM). Ileal digestibility of amino acids was highest for SBM among the feed ingredients. Soybean meal had the greatest digestibility for lysine followed by CM, corn, wheat and MBM with DDGS being least digestible (P < 0.01). Methionine digestibility in SBM was greater (P < 0.01) than in corn, wheat, DDGS or CM, whereas MBM was the least digestible. For threonine, SBM had the highest digestibility and corn was the least digestible (P < 0.01), but there were no differences among other feed ingredients. Ranges in ileal amino acid digestibility were 69.2 (DDGS)-90.3% (SBM) for lysine, 78.4 (MBM)-91.8% (SBM) for methionine, 61.6 (corn)-84.0% (SBM) for threonine, and 78.9 (MBM)-93.0% (SBM) for tryptophan. In conclusion, there are considerable differences among protein sources in their ability to supply amino acid in a form utilizable by the duck. Therefore, more accurate diet formulation may be attained if digestible amino acids in a feed ingredient are taken into account.

## Infrared Bill Trimming in Pekin Ducks

Purdue - Applegate, Pajor, Garner

**Project Award:** \$31,056

**Cash Match:** \$10,500 (Maple Leaf Farms)

**Summary:** Observations of ducks displaying behavior of using their bill on other ducks was reduced when given straw as an enrichment at 2 weeks of

age vs. control treatments. Tip-seared ducks had much less use of their bill on objects at 1 week of age vs. other treatments. Similarly, at 1 and 2 weeks of age, there was a trend towards reduction in ducks using their bill on themselves or other ducks when straw was provided, but not at 5 weeks. At processing (5 weeks), there were notable differences between treatment groups on tail feather and wing damage, control birds had a higher incidence than other treatment groups, meaning that provision of straw or bill trimming (sear or IR) alleviated some wing and tail feather damage that had occurred. No differences occurred, however, between treatment groups regarding bird performance (weight or FCR).

Notably, observations within each week, the duration of time spent eating was not influenced by bill trim method vs. the control. However, in observations of time spent resting, ducks that were tip-seared spent less time resting during week 2 vs. control or infra-red trim.

Implications of what has been determined thus far through this research: 1) Infrared trimming appears to provide some behavioral differences in short-term vs. heat searing (up to 1 week of age); 2) Long-term ramifications of not bill trimming results in wing and tail feather damage to birds by processing age (35 days of age); 3) Provision of straw alleviates some of the negative results of wing and tail feather damage at processing age (35 days of age), however, may not be practically implemented in raised floor housing with manure scrape or flush systems.

## Can Lighting Programs be Manipulated in the Growing Phase to Improve the Skeletal Integrity of Commercial Egg Layers

Purdue - Hester

**Project Award:** \$19,500

**Cash Match:** \$6,500 (Hy-Line International)

**Summary:** The hypothesis was that a slower, more gradual decline in light hours, i.e., the slow lighting program, would improve skeletal integrity by delaying sexual maturity. Although the slow, as compared to the rapid lighting regimen, delayed sexual maturity as indicated by age of first egg laid (Arango et al., 2007) and decreased bone length and area (experiment 2) most likely through later growth plate closure, it did not culminate into improved bone mineralization. Results indicate that pullets exposed to rapid lighting programs have better BMD at 66 weeks of age than birds of the slow lighting regimen. With the exception of the Hy-Line Brown, earlier sexual maturity of pullets exposed to the rapid lighting program led to a higher peak in egg production (to 39 weeks) when compared to birds of the slow and moderate lighting programs. Egg production (to 39 weeks) of the Hy-Line Brown hens subjected to the rapid lighting regimen also had higher egg production than hens of the moderate, but not the slow lighting regimen (Arango et al., 2007 and personal communication with Hy-Line International). This earlier peak in egg production by hens exposed to the rapid lighting program as pullets (Arango et al., 2007) may lead to lower egg production by end of lay. The end result would be similar total egg output for hens on each of the 3 lighting regimens. If this scenario proves to be true, then hens of the rapid lighting program would have lower egg production at the end of lay (66 weeks) than those that were subjected to the slow lighting program. The lowered end of egg production of hens of the rapid lighting program would result in less demand for bone calcium, leading to improved bone mineralization at 66 weeks. It is possible that lighting program in the growing stage of a pullet may not impact the occurrence of osteoporosis later in the laying or life cycle as much as egg production status. Results on bone mineralization of hens at 66 weeks could be more affected by number of eggs laid and amount of shell produced by hens at the end of lay. Experimental results are based solely on bones collected at 66 weeks after 1 complete laying cycle. If data were collected during the exposure to the lighting treatments, in addition to collection from layers throughout the laying life cycle, a better timeline could be developed for a laying hen's skeletal integrity.

## Regulation of the Growth of Poultry Skeletal Muscle

SDSU - McFarland, OSU - Velleman

**Project Award:** \$45,000

**Cash Match:** \$6,250 (South Dakota Poultry Industries Assn, George & Edna Jaap Poultry Research Fund)

**Summary:** To determine if differential response to growth factor stimuli between subpopulations of satellite cells was due to variation in the levels of activated intracellular signaling proteins, the levels of phospho-MAPK (phospho-ERK 1/2) were determined in clonal populations. The results suggest that variation in responsiveness to growth factor stimuli among satellite cell populations within muscles may be due to several different reasons. Some differences in cell responsiveness appear to be due to variation in phospho-MAPK generation.

Transforming growth factor- $\beta$ 1 (TGF- $\beta$ 1) is a potent inhibitor of muscle cell proliferation and differentiation. Decorin, a small proteoglycan in the extracellular matrix, binds to TGF- $\beta$ 1 and modulates the activity of TGF- $\beta$ 1 during muscle cell growth and development. However, its interaction with TGF- $\beta$ 1 and involvement in myogenesis is not well characterized. Results suggest that decorin induces myogenic satellite cell proliferation and differentiation by regulating cellular responsiveness to TGF- $\beta$ 1. An alternative TGF- $\beta$ 1-independent pathway may be involved in the regulation of satellite cells by decorin.

The syndecans are a family of cell-surface heparan sulfate proteoglycans consisting of a core protein with covalently attached glycosaminoglycan (GAG) chains. Syndecan-4 expression in skeletal muscle is increased in growth-selected animals during proliferation. Previous studies have suggested that cell-surface heparan sulfate proteoglycans like syndecan-4 are involved in fibroblast growth factor 2 (FGF2) signaling by FGF2 binding to the heparan sulfate

chains. Data suggests that syndecan-4 functions in an FGF2-independent manner and the GAG chains attached to the syndecan-4 core protein are not required for syndecan-4 to affect turkey satellite cell proliferation and the initial differentiation.

The membrane-associated heparan sulfate proteoglycan families, consisting of the syndecans and glypicans, are low-affinity receptors for fibroblast growth factor 2 (FGF2) that are essential in regulating the cellular response to FGF2. The results suggest that FGF2 growth factor signaling is, in part, regulated by an autoregulatory loop involving FGF2 regulation of syndecan-4 and glypican-1 expression and will affect the growth of skeletal muscle by modulating the proliferation and differentiation of satellite cells.

Transforming growth factor- $\beta$ 1 (TGF- $\beta$ 1) is a potent inhibitor of muscle cell proliferation and differentiation. The TGF- $\beta$ 1 signal is carried by Smad proteins into the cell nucleus, resulting in the regulation of the expression of key myogenic regulatory factors including MyoD and myogenin during myogenesis. However, to date, the molecular mechanism of the inhibition by Smad-mediated TGF- $\beta$ 1 signaling on the function of the myogenic regulatory factors has not been well understood. Data suggest that LSN satellite cells are more responsive to a Smad3-dependent TGF- $\beta$ 1 signaling pathway than normal satellite cells, and a Smad3-independent pathway is also likely involved in the regulation of satellite cell proliferation and differentiation.

These data demonstrate the importance of growth factors and their interaction with the extracellular matrix, especially the proteoglycans, in regulating poultry skeletal muscle growth and development. An improved understanding of how these important components regulate skeletal muscle development in poultry and other meat animals will lead to strategies to increase production efficiency.

<b>MPRP Approved Projects FY 2008</b>	<b>MPRP Funds</b>	<b>Cash Match</b>
<b>Further Evaluation of Feeding Distillers Dried Grains with Solubles in Non-Feed Withdrawal Molt Programs for Laying Hens</b> <i>U of IL - Koelkebeck, Parsons</i>	<b>\$18,000</b>	<b>\$8,000</b> (44%)
<b>Further Evaluation of Varying Length Feeding of Prebiotics as Replacement for Antibiotic Growth Promoters</b> <i>U of IL - Parsons</i>	<b>\$28,000</b>	<b>\$12,000</b> (43%)
<b>Production of Ovotransferrin from Egg White for Antimicrobial Application</b> <i>ISU - Ahn, Lee</i>	<b>\$78,604</b>	<b>\$14,035</b> (18%)
<b>Femur Spiral Fracturing: Genetic Influence &amp; Femur Composition in Today's Commercial Toms</b> <i>MSU - Karcher</i>	<b>\$51,768</b>	<b>\$13,500</b> (26%)
<b>Development of Immunogens to Protect Against Turkey Cellulitis</b> <i>U of MN - Foster</i>	<b>\$35,741</b>	<b>\$11,962</b> (33%)
<b>Market Turkey Response to Dietary Protein as an Energy Source</b> <i>U of MN - Noll</i>	<b>\$26,439</b>	<b>\$8,813</b> (33%)
<b>Turkey Cellulitis: Descriptive Epidemiology &amp; Molecular Characterization of Potential Etiological Agents</b> <i>U of MN - Wells, Oliveira</i>	<b>\$69,375</b>	<b>\$23,128</b> (33%)
<b>Coccidiosis in Game Birds</b> <i>NDSU - Gibbs</i>	<b>\$16,780</b>	<b>\$4,375</b> (26%)
<b>Human-Animal Interactions in the Turkey Industry</b> <i>OSU - Botheras</i>	<b>\$7,861</b>	<b>\$5,000</b> (64%)
<b>Incubation Conditions &amp; Bone Integrity in Pekin Ducks</b> <i>Purdue - Akkus, Applegate</i>	<b>\$31,789</b>	<b>\$7,950</b> (25%)
<b>Regulation of the Growth of Poultry Skeletal Muscle</b> <i>SDSU - McFarland, OSU - Velleman</i>	<b>\$25,000</b>	<b>\$6,250</b> (25%)
<b>Identifying Causes that Develop the Pink Color Defect in Cooked Ground Turkey Breasts &amp; Red Discoloration of Turkey Thighs Associated with the Bone</b> <i>U of WI - Claus</i>	<b>\$39,194</b>	<b>\$13,106</b> (33%)
<b>Total Research (30% Cash Match)</b>	<b>\$428,551</b>	<b>\$128,119</b>
<b>Iowa State Administration</b>	<b>\$20,000</b>	-
<b>MPC Outreach</b>	<b>\$20,000</b>	<b>\$20,000</b>
<b>Total MPRP Projects (32% Cash Match)</b>	<b>\$468,551</b>	<b>\$148,119</b>

## 2008 MPRP Project Objectives

### Further Evaluation of Feeding Distillers Dried Grains with Solubles in Non-Feed Withdrawal Molt Programs for Laying Hens

U of IL - Koelkebeck, Parsons

**Project Award:** \$18,000

**Cash Match:** \$8,000 (Dakota Gold Research Associations; JBS United)

**Objectives:** In recent years, concern for hens during an induced molt has been expressed by animal activists groups contending they experience stress due to feed removal, necessary to induce a molt. Many food companies, i.e., McDonalds, have told suppliers to no longer use feed withdrawal programs to initiate molt. Thus, development of viable, economical methods of induced molting without feed withdrawal is very important to the continued viability of the commercial egg industry.

Some egg producers have been using corn distiller's dried grains with solubles (DDGS) in layer diets and non-feed withdrawal molt diets at the 10-20% level. In many areas of the Midwest, DDGS is very inexpensive and highly cost effective. Thus, it is of interest to evaluate the use of moderate and high levels of DDGS in molt diets. The objective is to evaluate the effects of feeding varying levels of DDGS with corn, wheat middlings, and soybean hulls on long-term laying hen postmolt performance.

Feeding corn, wheat middlings, and soybean diets have shown good results in previous experiments. The objective here is to determine if feeding diets containing several different levels of DDGS would provide acceptable postmolt performance in a non-feed withdrawal molt program for laying hens. Additionally, hen consumption of these diets will be restricted to 14 lbs/100 hens/day, similar to what is done in the commercial industry.

### Further Evaluation of Varying Length Feeding of Prebiotics as Replacement for Antibiotic Growth Promoters

U of IL - Parsons

**Project Award:** \$28,000

**Cash Match:** \$12,000 (Dakota Gold Research Association, JBS United)

**Objectives:** This project will further evaluate varying length feeding of several feed additives that have potential for replacing antibiotic growth promoters in broiler chicken diets. The feeding of low-level antibiotic growth promoters is being severely criticized and scrutinized by federal regulatory agencies and this practice will likely be restricted or banned in the future. Several experiments will be conducted with broiler chickens to evaluate several prebiotic ingredients such as various indigestible carbohydrates, Grobiotic-P, and DDGS fiber. Experiments will include measurements of growth performance, nutrient digestibility, and different measurements of dietary effects on the microbial ecology of the intestinal tract. The research is directly applicable to broiler chickens, with the results also likely being applicable to turkeys and ducks as well. Specific objectives: 1) Evaluate effectiveness of short-term and longer-term feeding of prebiotic ingredients (Grobiotic-P, Temulose, Alternan, DDGS fiber) for improving growth and nutrient utilization in antibiotic-free diets of young chicks; and 2) Evaluate effect of various feed additives or ingredients on the gut microflora and intestinal health of young chicks.

### Production of Ovotransferrin from Egg White for Antimicrobial Application

ISU - Ahn, Lee

**Project Award:** \$78,604

**Cash Match:** \$14,035 (Iowa Egg Council)

**Objectives:** The long-term goal of this project is separating ovotransferrin from egg white in commercial scales and using it as a natural antimicrobial

agent in foods. Objectives are: 1) Develop a commercial-scale separation method of a food-grade ovotransferrin from egg white and 2) Test the antimicrobial capability of activated ovotransferrin in meat systems.

Objective 1: Scaling up of the separation process. Conditions selected from the laboratory-scale study will be used as starting conditions for a large scale separation of ovotransferrin from egg white. Because of the dramatic increase in volume, saturation conditions for iron, mixing, centrifugation, and the responses of egg albumin and ovotransferrin to pH and ethanol may be different. Optimal conditions for all parameters tested for laboratory scale preparation will be tested again for large-scale preparation of ovotransferrin from egg white.

Objective 2: Testing the antimicrobial capability of ovotransferrin with meat systems. Separated ovotransferrin will be solubilized, iron removed, activated, and then verified for its antimicrobial activity using meat systems. Effects of activated ovotransferrin alone and in combination with other additives such as EDTA, citric acid, and lysozyme on the survival of *L. monocytogenes* and *E. coli* O157:H7 in ground raw meat will be tested. Because ovotransferrin is reported to decrease inactivation temperature for many pathogens, ovotransferrin alone and its combinations with EDTA, citric acid, and lysozyme will be added in ground meat and heated at different temperatures to determine if ovotransferrin and its combinations show any effect in lowering inactivation temperature for *L. monocytogenes* and *E. coli* O157:H7 in meat.

As a result, a simple, economical method that can separate ovotransferrin from egg white in commercial-scales will be developed. Also expected to be found are the effects of additives on the antimicrobial activities of ovotransferrin in meat. Synergistic effects of ovotransferrin in lowering inactivation temperature of pathogens during heating can be determined. Reduction of both pathogenic and spoilage microorganisms in meat will provide significant economical benefits to the meat industry by improving microbial safety and producing longer shelf life, which will also be important for consumers.

### Femur Spiral Fracturing: Genetic Influence & Femur Composition in Today's Commercial Toms

MSU - Karcher

**Project Award:** \$51,768

**Cash Match:** \$13,500 (Michigan State University Funds)

**Objectives:** Project goal is to elucidate characteristics of the femur that lead to spiral fracturing in commercial turkeys. Successful completion will help to identify strategies to enhance skeletal soundness resulting in reduced economic loss and improved well-being.

Objective 1: Establish influence of genetic selection on femur composition. Genetic selection of turkeys has resulted in a tom that obtains 40+ lbs in 20 weeks of age, an increase from 30 lbs at 18 weeks over the last 2 decades. The hypothesis is that the potential for rapid growth has reduced the ability of the bone to adapt its mechanical competence to changes in physiological loads. Using genetic lines with different selection pressures for growth and carcass (breast) yield will provide insight into how femur composition has changed as a result of the selection pressure.

Objective 2: Determine factors responsible for failure. The increasing incidence of femoral spiral fractures in the field requires an investigation into what is contributing to femur failure. Using fractured bones collected from the field, the effects of bone morphology, size, tissue level strength, tissue mineralization, crystal maturity and collagen orientation on the quality of femurs from toms experiencing spiral fractures will be investigated.

The amount of money lost to producers in the country due to spiral fracturing is in the millions annually with a large proportion of those producers located in the Midwest.

### **Development of Immunogens to Protect Against Turkey Cellulitis**

U of MN - Foster

**Project Award:** \$35,741

**Cash Match:** \$11,962 (Minnesota Turkey Research & Promotion Council)

**Objectives:** The objective is to produce 11 different recombinant fusion proteins corresponding to fragments of a toxin of *Clostridium septicum*, believed to be one of the causative agents of turkey cellulitis. The plan is to produce up to 200mg of each of the purified recombinant fusion proteins to be used in conjunction with an adjuvant, to serve as an immunogen, when presented to turkeys. To avoid producing a biologically active and potentially dangerous exotoxin, which would require biohazard level 3 containment conditions, scientists in this study have chosen to express multiple fragments of the *Clostridium septicum* a toxin gene in a fusion polypeptide system. Additionally, the expression of the *Clostridium septicum* a toxin and its mutant isoforms are covered by an all-encompassing U.S. patent that would be infringed upon if anyone were to express the complete *Clostridium septicum* a toxin or its isoforms.

Overall goals: 1) Produce 7 contiguous fragments of the  $\alpha$  toxin of *Clostridium septicum* by designing 174-183 bp oligonucleotides to span the entire 1227 bp exotoxin gene. Four additional oligonucleotides will be designed that have base pair changes introduced into domains previously shown to have biological activity specific to the  $\alpha$  toxin; 2) Use the above fragments in a bacterial expression plasmid system to produce recombinant  $\alpha$  toxin subunits. The pQE40 plasmid will utilize a strong promoter/operator system (for expression in *E. coli* M15 bacterial cells) to drive expression of the  $\alpha$  toxin subunit DNA fragment sequences. This vector also has a fusion gene that encodes a protein (DHFR) to stabilize recombinant  $\alpha$  toxin subunits, thus, avoiding conjugation to a larger molecule for stability and immunogenicity. Finally, a 6x His tag (amino acid, histidine repeated 6 times) will be incorporated into final recombinant polypeptide for purification from bacterial lysates; 3) Purify each of the  $\alpha$  toxin polypeptide subunits using a nickel Ni-NTA agarose resin column which binds the 6x His tag in fusion recombinant polypeptide. This purification method should yield up to 200mg of recombinant polypeptide/fragment clone; and 4) Test each of the fusion protein  $\alpha$  toxin polypeptide subunits in birds in the field.

### **Market Turkey Response to Dietary Protein as an Energy Source**

U of MN - Noll

**Project Award:** \$26,439

**Cash Match:** \$8,813 (Minnesota Turkey Research & Promotion Council)

**Objectives:** The objective of this project is to determine the response of market turkey toms to diets varying in calorie/protein (amino acid) density in diets low in supplemental fat and high in alternative protein content on turkey growth performance and breast meat yield.

The biofuels industry will continue to change the availability and types of ingredients available for poultry feeding. Besides utilization of corn in the production of ethanol, biodiesel production will also change the feed ingredient picture. Biodiesel production utilizes fat sources such as animal fats, restaurant grease, vegetable oils and extraction of oils from feedstocks such as oilseeds and corn processing. The future impact on the poultry feed industry will be fewer available fat sources and an increased supply of extracted oil seed meals such as canola meal and soybean meal to go along with increased supplies of distillers grains. For

producers to economically formulate diets, information is needed on the response to dietary energy and dietary protein by current genetic strains of turkeys. However, there is little current information on market turkey response to differing energy regimes. Establishing such responses would also be useful in the future for being able to better assess responses to exogenous enzymes and other feed additives proposed to improve energy utilization.

### **Turkey Cellulitis: Descriptive Epidemiology & Molecular Characterization of Potential Etiological Agents**

U of MN - Oliveira, Wells

**Project Award:** \$69,375

**Cash Match:** \$23,128 (Minnesota Turkey Research & Promotion Council)

**Objectives:** The objectives are: 1) Characterize the descriptive epidemiology of turkey cellulitis, including evaluation of time, place, and host characteristics of this disease in turkeys; and 2) Identify molecular signatures of pathotypes of *Clostridia* associated with turkey cellulitis based on the analysis of the molecular epidemiology of infection.

### **Coccidiosis in Game Birds**

NDSU - Gibbs

**Project Award:** \$16,780

**Cash Match:** \$4,375 (North American Gamebird Association)

**Objectives:** Coccidiosis is a major limitation to the production and marketing of game species of birds in America, principally Bobwhite Quail, Ringneck Pheasants, and the Chukar Partridge. Virtually no research has been conducted on the disease agents, other than to describe some of the species, and to conduct tests on the potential for control by existing anticoccidial drugs. Clearly, an organized industry effort is needed to generate the technical capability of control of coccidiosis, and to produce a vaccine for more reliable prevention.

Objective 1: Identify responsible disease agents in the 3 avian species of interest. The coccidia of avian species are host-specific, each bird has its own species of coccidia. Even closely related species of birds may have separate species of coccidia. Thus, identification of those coccidia species responsible for disease in Bobwhite Quail, Ringneck Pheasants, and the Chukar Partridge is of utmost importance.

Objective 2: Several laboratory tests of existing anticoccidial products will be conducted with each of the target bird species against infections with the species of coccidia identified in Objective 1. Additional testing is needed to determine whether the anticoccidials are toxic when used in these particular avian species.

Development of vaccines by attenuation of 1 or 2 important species of coccidia in each type of bird might be effectively employed for a more reliable control method. Although this is unlikely to be completed here, the findings from this study will give preliminary data so that vaccination in game birds could be further explored.

### **Human-Animal Interactions in the Turkey Industry**

OSU - Botheras

**Project Award:** \$7,861

**Cash Match:** \$5,000 (Cooper Farms, Ohio Poultry Association)

**Objectives:** The long-term goals are to better understand human-animal relationships in the turkey industry, and the potential to manipulate these relationships through education and training programs to ultimately enhance bird welfare and productivity. The impetus for this research is the

substantial evidence in other animals, including laying hens and broiler chickens, that these human-animal relationships have significant impact on animal welfare and productivity. Research will specifically investigate fear of humans in turkeys and the possible relationships with bird productivity and welfare. Evidence of bird fear, bird welfare and bird productivity relationships will demonstrate possible commercial opportunities to improve bird welfare and productivity. Indeed, subsequent research in commercial situations to identify the stockperson factors, such as attitude and behavior, which regulate the fear response of turkeys to humans, will enable the development of stockperson training programs aimed at improving stockmanship by improving the human-animal relationship in the turkey industry.

A pilot study will be conducted to develop a suitable methodology to assess fear of humans in turkeys of different ages in a standardized behavioral test. In broiler chickens, several behavioral tests have been developed to assess fear of humans in commercial situations. Such tests form the logical initial basis for the development of suitable tests of fear of humans in turkeys of different ages. Research will be conducted in commercial turkey units in the Midwest, and will investigate the variation in bird behavioral responses to humans (fear of humans), and their relationships with stockperson (human) behavior and bird productivity and welfare.

### Regulation of the Growth of Poultry Skeletal Muscle

OSU - Velleman, SDSU - McFarland

**Project Award:** \$25,000

**Cash Match:** \$6,250 (South Dakota Poultry Industries Assoc., George & Edna Jaap Poultry Research Fund)

**Objectives:** The long-range research goals are to improve efficiency and rates of muscle (meat) accretion in poultry and to identify biochemical parameters that might improve selection criteria of poultry. The major focus is elucidation of mechanisms which regulate the growth of skeletal muscle tissue in poultry. Major factors influencing the growth of muscle are polypeptide growth factors and extracellular matrix. It has become increasingly clear that these two components of growth are intimately tied together and each interacts with and regulates the activity of the other.

This project will utilize myogenic satellite cells in culture. Satellite cells are located adjacent to skeletal muscle fibers and are responsible for postnatal skeletal muscle growth and development. Satellite cells isolated from 2 different muscles of the turkey and chicken (pectoralis major and biceps femoris) will be used. This project is a continuation of research started in 2007. It has been demonstrated that satellite cells can proliferate in the presence of different fatty acid profiles and dramatically change the phospholipid composition of their membranes. This ongoing project is designed to test the hypothesis that poultry satellite cells grown to incorporate various types and proportions of fatty acids in their membrane lipids, differ in their responsiveness to growth factor stimuli and expression of particular heparan sulfate proteoglycans (syndecans and glypicans). Following completion of these studies the hypothesis that changes in membrane phospholipid composition will influence the mitogen-activated protein kinase signaling pathway and mitochondrial activity of proliferating cells will be tested. To further examine the effect of altered membrane phospholipid composition on cell signaling, plans are to measure expression of syndecan-3, -4, and glypican-1 in proliferating and differentiating satellite cells exposed to increasing levels of fibroblast growth factor-2.

This is designed to improve the understanding of the mechanisms regulating skeletal muscle growth, in particular how dietary lipid composition influences muscle development. This research will ultimately lead to methods to improve the efficiency of poultry meat production.

### Incubation Conditions & Bone Integrity in Pekin Ducks

Purdue - Akkus, Applegate

**Project Award:** \$31,789

**Cash Match:** \$7,950 (Maple Leaf Farms)

**Objectives:** Given variation in moisture loss from incubating eggs (due to inability to reduce humidity particularly in summer months), the resultant air space available for duckling (applicable to poult and chicks) can be limiting. Physical space limitation for bird to pip through shell may cause respiratory and metabolic acidosis/ketosis and have an effect on hatchling quality. The duck industry is facing a high incidence of keel abnormalities and long bone deformations that can be noted in the hatchery as well as the processing plant. Higher incidence in more humid geographies and times of year are suggestive of an eggshell conductance and humidity loss/gas exchange issue in the hatchery. Additionally, it is well known that multi-stage incubators can create micro-climates with dramatic differences in incubation environments (heat/humidity variation). Therefore, the working hypothesis is that variation in moisture loss caused by uneven incubator microclimates creates a space limitation for the embryo to get out of the egg, requiring the bird to exert itself more, thereby damaging the bird's rib/keel. The goal of this study is to determine if humidity loss and temperature/humidity variation from multi-stage incubators creates any short and/or long-term damage to skeletal integrity of the Pekin duckling.

### Identifying Causes that Develop the Pink Color Defect in Cooked Ground Turkey Breasts & Red Discoloration of Turkey Thighs Associated with the Bone

U of WI - Claus

**Project Award:** \$39,194

**Cash Match:** \$13,106 (Jennie-O Turkey Store)

**Objectives:** The goal is to identify and characterize pink pigments and factors associated with the presence of pink pigments in cooked ground turkey breast and intact thigh muscle. This research addresses maintaining turkey meat quality during further processing. Project objectives: 1) Characterize pink pigments associated with storing presalted and ground turkey breast; 2) Evaluate ability of pink inhibiting ingredient to control pink discoloration in cooked ground turkey breast produced from presalted stored and ground turkey; 3) Investigate differences in cooked color and pigment characteristics associated with different turkey breast trim locations in cooked ground turkey breast; and 4) Evaluate chemical and physical differences between turkey thighs with and without red around the bone.

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