

Future of Poultry Science Symposium

The future of poultry science research: Things I think I think^{1,2}

R. L. Taylor Jr.³

Department of Animal and Nutritional Sciences, University of New Hampshire, Durham 03824

ABSTRACT Much poultry research progress has occurred over the first century of the Poultry Science Association. During that time, specific problems have been solved and much basic biological knowledge has been gained. Scientific discovery has exceeded its integration into foundation concepts. Researchers need to be involved in the public's development of critical thinking skills to enable discernment of fact versus fiction. Academic, government, and private institutions

need to hire the best people. Issues of insufficient research funding will be remedied by a combination of strategies rather than by a single cure. Scientific advocacy for poultry-related issues is critical to success. Two other keys to the future are funding for higher-risk projects, whose outcome is truly unknown, and specific allocations for new investigators. Diligent, ongoing efforts by poultry scientists will enable progress beyond the challenges.

Key words: research priorities, funding, scientific advocacy

2009 Poultry Science 88:1334–1338

doi:10.3382/ps.2009-00056

The research progress of the first 100 yr of poultry science merits effusive praise. Knowledge in the varied areas of poultry science as well as in basic biology has accumulated at a rate unimagined a century ago. Before presenting any forecast, I believe that it is vital to provide the perspective of these prognostications. I am a 31-yr veteran member of the Poultry Science Association. This Poultry Science Association centennial meeting marks my 28th overall and 24th consecutive year. If investigational disciplines provide a lens for one's research view, I am a university immunologist who acquired genetic expertise by necessity. Patient, understanding colleagues have facilitated periodic ventures into other scientific domains. Predicting the future is inexact, if not a fool's errand. With that last caveat and the aforementioned background, I present strategies to meet future challenges no matter what they may be.

A plethora of research issues face science, in general, and poultry science, in particular. These topics include but are not limited to production efficiency, animal health, welfare, product quality, and food safety. Watts (2007) delineated the significant new challenges to the poultry industry as foreign trade, energy-feed, flock health, and human resources. Future research priorities

on each of these issues merit dialog beyond the scope of this essay. Three themes that follow are crucial to sustained scientific success and fostering public support.

Scientists should make a concerted effort to comprehend the knowledge gained. We do not fully understand all we have discovered. Scanes (2008a) eloquently described "...the development of a suitable theoretical or conceptual basis for our field." Much time, effort, and resources have been expended to advance knowledge. Time should be allocated to digest the knowledge gained and to integrate varied findings into foundation concepts. Second, at the interface of research and education, changing United States demographics including a move away from agrarian life has dimmed the understanding of the origin of their food and how it arrives at the table. Poultry science research and the requisite communication of the results have a role in expanding the public's awareness of their food. Third, our scientific efforts should enable students and the public to develop critical thinking skills to distinguish assertions supported by fact from fantasy. That is, each person should have a personal baloney detector. Expansion of electronic media has smoothed information distribution at some cost to accuracy. Individuals need to expand their vigilance in assessing their various daily data streams.

©2009 Poultry Science Association Inc.

Received February 2, 2009.

Accepted February 5, 2009.

¹This is Scientific Contribution Number 2381 from the New Hampshire Agricultural Experiment Station.

²Presented as part of Symposium: Future of Poultry Science, July 22, 2008, at the Poultry Science Association meeting, Niagara Falls, Ontario, Canada.

³Corresponding author: bob.taylor@unh.edu

Hire the Best

Our academic, government, and private sector institutions must hire the best people. Current personnel have

to overcome innate trepidation at hiring others smarter than themselves. A colleague and I once participated in a faculty search at whose conclusion one committee member stated, "This candidate is the most qualified and the best scientist, but is that really what we want?" Such a regressive attitude clearly hinders progress. Related to the first proposal is the disinclination to hire experience. Continued hiring at junior levels is always expedient but not always prudent. Arguments may be promulgated that available resources do not support personnel above the entry level, but the best available person may have greater experience.

A *Poultry Science* editorial (Scanes, 2008b) queried if adequate attention is applied to succession. That article made a case for "...thoughtful strategic planning at the department and college levels with substantive input from industry" (Scanes, 2008b). The plans should ensure adequate research and education for future scientists to staff open positions created by retirement, new initiatives, or other factors. Unfortunately, strategic plans, however insightful and well-intended, become redirected at the first institutional hiccup or at the slightest loss of departmental focus. In other words, good plans are often poorly executed.

Scientists as well as administrators need to realize and acknowledge that each individual contributes but each contribution will be different. It is unrealistic to expect one person to be exactly like the next. Among the varied skills are educators, communicators, rainmakers who have well-funded programs, and integrators. Every scientist will not excel in all of these areas, but departmental or disciplinary groups should encompass these competencies. Hutt (1965) described the shift from

species-based faculty to discipline-based faculty. While acknowledging that distinct disciplines transcend species classifications, Hutt (1965) voiced support for specialists to examine and address the unique facets of each agricultural species. The poultry science research community needs individuals with broad disciplinary education, but it also needs individuals who possess scientific as well as practical poultry knowledge.

Research Funds

Ever-increasing proportions of time are dedicated to fund procurement. Figure 1 shows the US Agricultural Research Funds allocated to the 4 major agricultural animal species between 1966 and 2006. Poultry and swine allocations lag those of dairy and beef cattle. Figure 2 reveals the difference between actual funding and inflation. To obtain this, funds allocated in 1966 were adjusted for the 4.67% average inflation rate for the 40-yr period to 2006. The adjusted 2006 values were then subtracted from the actual 2006 allocation for each species giving a difference above or below inflation. Poultry is alone in not having kept pace with inflation during this 40-yr period. This result is highly inequitable as well as unacceptable, particularly in light of the preminent position of poultry in the animal agriculture portion of the economy.

The deficiency raises questions such as "Is poultry research a victim of its success?" Consider the changes in the chicken industry over more than 30 yr. Chicken consumption more than doubled from 42 to 87 pounds (19.1 to 39.5 kg) per capita from 1972 to 2007. The 2007 chicken figure translates into 43% of the animal

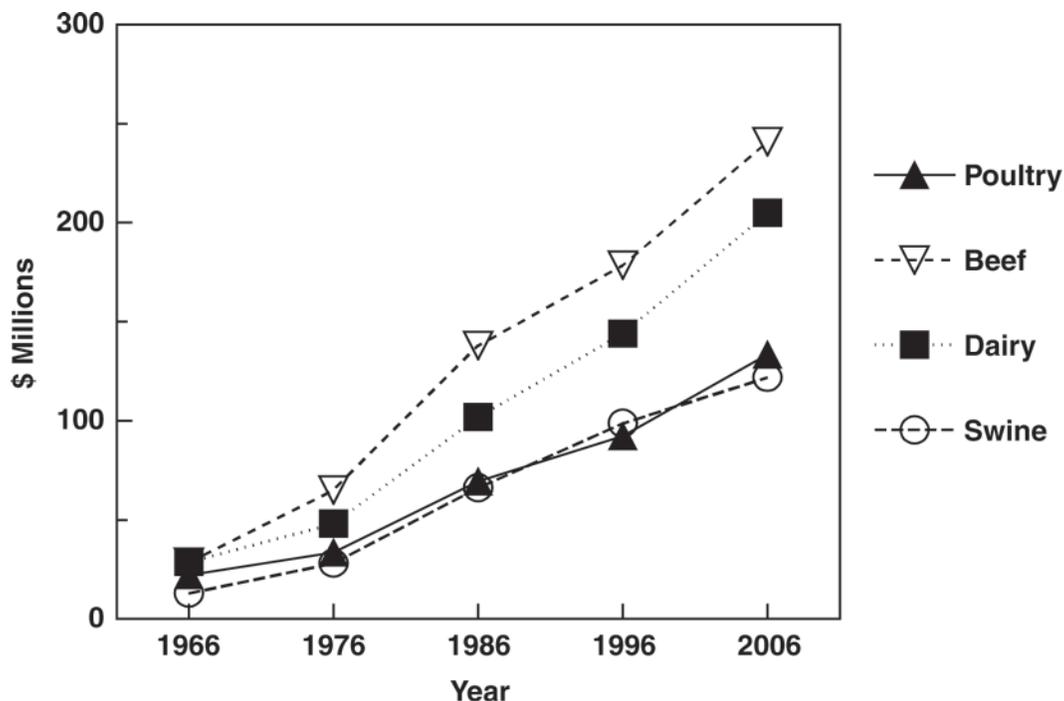


Figure 1. The U.S. Agricultural Research Funds from federal, state, and other sources allocated to the 4 major agricultural animal species between 1966 and 2006 (USDA-CSREES 1996, 2006; Pardue, 1997).

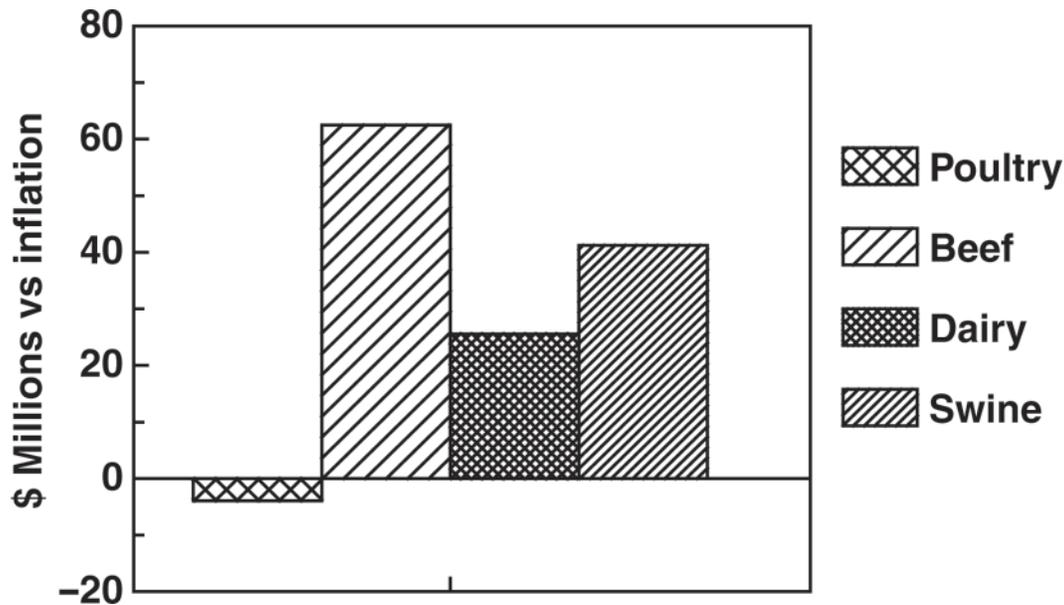


Figure 2. Difference above or below inflation for US Agricultural Research Funds from federal, state, and other sources allocated to the 4 major agricultural animal species in 2006 (USDA-CSREES, 2006). Funds allocated in 1966 (Pardue, 1997) were adjusted using the average annual inflation rate for the 40-yr period to 2006 (<http://inflationdata.com/Inflation/Inflation/Inflation.asp>). The adjusted 2006 values were then subtracted from the actual 2006 allocation for each species giving the difference.

protein among chicken, beef, and pork sources. In 1975, the top 10 broiler companies had 50% of production with the top 3 companies controlling 21% of the total. By 2007, the top 10 broiler companies had reached 79% of total production, whereas the top 3 companies represented 54%. Only 3 companies from the 1975 top 10 remained in business (Watts, 2007), whereas the other 7 vanished through acquisition.

Because the allocation data represent funds from federal, state, and other sources as reported by the Cooperative State Research, Education, and Extension Service (USDA-CSREES, 1996, 2006; Pardue, 1997), the lag versus inflation goes well beyond a dearth of poultry-related applications for competitive funding. To rectify this situation, we must increase our proficiency at what historian Steve Fraser calls “the democracy game” (Fraser, 2008). It means ongoing participation in electoral politics to ensure that poultry issues are heard, acted upon, and that allocations represent a fair share of resources. Further, this effort requires education, advocacy, and political action at a level of sophistication exceeding the level to which we are accustomed.

For these processes to be successful, the scientific community needs to alter its relationship with the public. Scientists need to be more effective in communicating the scientific benefit of their work. Scientists also need to present constructive answers to concerns of the public. Public discomfort may stem from issues including scientific quality or integrity, value of the investigations, or animal welfare. Nonscientists need to understand that continued research produces substantial benefit to them. The researchers need to engage the citizenry to build connections (Leshner, 2008). Elected officials should be educated on the value of basic re-

search and informed of scientists’ support with the expectation that they take a stand. Once these positions are known, the scientist must weigh them at the time of voting (McCormick, 2008). How effectively have we as poultry scientists articulated the needs and the benefits of research?

Research Priorities

Research priorities should extend beyond a buzzword checklist. Genomics, proteomics, transcriptomics, metabolomics, and metagenomics are among the latest trends. Institutions hire, begin new initiatives, and agencies establish grant programs according to buzzwords without a long view. Once done, that item is considered addressed, checked off, and a new goal moves up the list. The initiatives or grant programs do not retain a long-term commitment.

To get beyond buzzwords, institutions must balance short-term results versus long-term gain with the latter being classified across a 10- to 20-yr window. There is a need to differentiate between research programs that answer essential questions over the long-term and efforts that simply follow the money. The standard boilerplate for employment advertisements includes some variant of the phrase “...development of an independent, externally funded research program.” Some research can solve a specific problem quickly and completely. Other scientific questions require considerable time and resource inputs. Sustaining long-term research programs by external support alone is at best a Herculean effort and at worst a task of Sisyphus.

Investment in infrastructure is needed. Infrastructure, in this case, includes support for programs and

resources with less emphasis on buildings or other facilities. Crucial experiments yielding data with high potential value cannot be done without an enduring commitment. As an example, long-term selection performed by P. B. Siegel at Virginia Tech (Blacksburg, VA) could not be executed in today's funding environment. Selection for high or low 8-wk BW (Siegel, 1962) and high or low antibody response to SRBC (Siegel and Gross, 1980) resulted in a wealth of indispensable data about genetic selection. The data could not have been obtained without the genetic stocks or the individual dedication and institutional commitment.

Scientists and the public should expect and demand a transparent funding process. One possible time-saving strategy for writers and reviewers alike would include using intensely screened short preproposals with fewer full grants submitted. Raising the risk profile of a portion of the research portfolio would enhance innovation. Perhaps a modest amount of any grant program should be allocated to some projects without preliminary data or projects that might not achieve their objectives, or both. Negative results reveal information of what not to do that may be as worthwhile as a positive outcome. This idea was echoed somewhat by Scanes (2008a): "... over-reliance on statistical significance without sufficient attention to biological significance and the potential impact to the industry."

Greater portions of the research portfolio should be allocated to new investigators. Distributing funds to new researchers will assist in raising the research risk profile already mentioned. More importantly, these individuals would have time to develop their research with relative freedom from funding anxiety. The Howard Hughes Medical Institute (Chevy Chase, MD) is pursuing such a strategy (Baker, 2008). Forty-two years is now the average age for a scientist's first National Institutes of Health grant. This fact in concert with long hours, extensive education and training, as well as the pull of other responsibilities in academic institutions means many bright people will choose alternative paths that are more rewarding either intellectually, financially, or both.

Administrative Cautions

For the future, administrative expectations need to be aligned with reality and communicated unambiguously. Greater financial needs clashing with fewer available resources means increased difficulty in the funding arena. External funds will address some but not all problems. Times have and will continue to change, but institutions, their leaders, and members must not forget where they came from. Administrators should seek counsel from those with institutional memory. Their information will likely explain why particular things were done in a certain way. Both administrators and colleagues should value the tasks and outputs of poultry scientists who serve the public including an important

industry. These 2 groups should understand that every contribution is unique as stated previously. Unfortunately, the value of outputs has diminished either by action or by neglect. That trend must be reversed. The importance of outputs (i.e., publications, student degrees, seminars, popular articles, etc.) should be elevated above the means to an output (i.e., grant, contract, etc.) as measures of success.

Final Observations

Here are some questions to ponder about the future of poultry research. Where will the future poultry science researchers originate? How do we educate the next generation of scientists having the requisite expertise? What opportunities exist or evolve for our research graduates? How do poultry scientists build adequate lasting relationships with stakeholders?

Government research programs must narrow or eliminate the gap between funds authorized and funds appropriated. Too frequently, dollars authorized far exceed the dollars appropriated. Furthermore, funding agencies should limit the intoxicating indirect costs to 25% with annual adjustments for inflation. As mentors in the research process, we need to help students to develop skills in reasoning and problem solving. We also need to develop exercises to increase students interpersonal skills because the ability to work with other people will have elevated importance. Collaborative work is becoming essential to success.

Warren Buffett, the billionaire chairman of the Berkshire Hathaway Corporation (Omaha, NE), stated: "Only when the tide goes out, do you discover who's been swimming naked." I temper my optimism with pragmatism about the future of poultry science research. Smart people with creative minds can solve future problems. The challenges we face require significant attention. However, I also believe the tide is going out. We need prompt action to address the issues lest we find who's been swimming naked.

ACKNOWLEDGMENTS

I thank Colin Scanes (University of Wisconsin, Milwaukee) for his kind invitation to present this talk. Margaret Coburn (University of New Hampshire, Durham) is acknowledged for her excellent assistance in the manuscript preparation. Stimulating, sometimes animated discussions with Chris Ashwell (North Carolina State University, Raleigh), Paul Cotter (Framingham State College, Framingham, MA), Mary Delany (University of California, Davis), Janet Fulton (Hy-Line International, Dallas Center, IA), Fred McCorkle (Central Michigan University, Mt. Pleasant), Muquarab Qureshi (Cooperative State Research, Education, and Extension Service, Washington, DC), and Robert Wideman (University of Arkansas, Fayetteville) proved indispensable in preparing this work.

REFERENCES

- Baker, B. 2008. Funding freeze chills research careers, too. *Boston Globe*. March 10:c1-c2.
- Fraser, S. 2008. *Wall Street: America's Dream Palace*. Yale University Press, New Haven, CT.
- Hutt, F. B. 1965. Whither poultry genetics. *World's Poult. Sci. J.* 21:53-61.
- Leshner, A. I. 2008. "Glocal" science advocacy. *Science* 319:877.
- McCormick, D. 2008. Resuscitating research funding. *Biotechniques* 44:159.
- Pardue, S. L. 1997. Educational opportunities and challenges in poultry science: Impact of resource allocation and industry needs. *Poult. Sci.* 76:938-943.
- Scanes, C. G. 2008a. Flowering of science. *Poult. Sci.* 87:397-398.
- Scanes, C. G. 2008b. Succession – A critical issue for the agricultural sciences. *Poult. Sci.* 87:605.
- Siegel, P. B. 1962. Selection for body weight at eight weeks of age. 1. Short term response and heritabilities. *Poult. Sci.* 41:954-962.
- Siegel, P. B., and W. B. Gross. 1980. Production and persistence of antibodies in chickens to sheep erythrocytes. 1. Directional selection. *Poult. Sci.* 59:1-5.
- USDA-CSREES. 1996. National Summary Tables. Table C. USDA, SAES, and Other Institutions by Subject of Investigation. USDA-CSREES, Washington, DC.
- USDA-CSREES. 2006. National Summary Tables. Table C. USDA, SAES, and Other Institutions by Subject of Investigation. USDA-CSREES, Washington, DC.
- Watts, G. 2007. The changing American chicken industry. *Watt Poultry USA* 8:28-30.