

Implementation Priorities in Protection of Plant, Animal, and Human Health

Team Members: Avery August, Ottar Bjornstad, Dave Filson, Chuck Gill, Nan Hanshaw, Joel Hersh, Ernest Hovingh (Co-chair), Mike Hulet, Scott Isard, Dave Johnson, Seogchan Kang (Co-chair), and Mary Kennett

1. Background

The rapid expansion of global commerce and human travel has greatly accelerated the movement of non-indigenous pathogens/pests and exotic variants of indigenous ones. As monitoring systems have become more sophisticated, detection of diseases caused by agents previously unknown to us is also on the rise. If history is a guide, these forces, coupled with global climate changes, will lead to the emergence of new diseases and reemergence of quiescent ones. Natural disasters also directly and indirectly threaten the health of plants, animals, and/or humans. Besides such natural threats, the “September 11” attacks and the subsequent anthrax releases brought home the grave threat of a deliberate spread of pathogens. The debilitating impact of deliberately induced disease outbreaks forced the nation to invest a huge amount of resources against this threat.

Current status of preparedness against these threats at the state and national levels presents both challenges and opportunities to the college. Dynamics of pathogens/pests and disease epidemics have biological, environmental, socioeconomical, and geospatial dimensions and thus require integrated analyses and utilization of heterogeneous knowledge via cooperation from diverse experts and stakeholders in order to understand and properly respond to them. Given the high frequency of pathogen/pest movements across political boundaries and the interconnections among state/national economies, cooperation between states/countries should also be integral to our preparedness. However, despite such needs and some successes toward this direction, most efforts to study and manage threats to plant, animal, and human health have been fragmented and limited to coping with immediate crises. Multiple problems have limited global and integrated responses, which include but are not limited to (i) poor cooperation among stakeholders with disparate but complementary expertise; (ii) difficulties in accessing accumulated data and knowledge because they are scattered, poorly organized, and archived via incompatible formats; and (iii) limited tools/mechanisms supporting cooperation across institutional and national boundaries. These problems present an opportunity for the college to lead the nation by offering new paradigms in protecting plant, animal, and human health through creative realignment of existing programs and strengths in research, education, and extension and strategic new investments.

Whether we consider naturally occurring or intentional acts to disrupt the security of plant, animal, or human health, a similar response is often warranted; surveillance, detection, discovery, response, and recovery are included. Planning and mitigation strategies to reduce the potential impact of such threats create a more resilient community. Providing information on establishing and maintaining healthy systems to individuals who are responsible for the various plant, animal or human systems, and information for response and recovery from disruptive events can reduce social, emotional and economic impact of affected communities. The college already has well-established human capital (experienced faculty/staff and relationships with stakeholders within and outside of the college), knowledge bases, and infrastructures; these

resources, if integrated properly and enhanced via new investment and collaboration with other colleges at Penn State and other institutions (e.g., state and federal agencies and universities), will help the college lead the transformation of state and national preparedness against natural and deliberate threats to plant, animal, and human health from fragmented regional efforts to a holistic global campaign. The committee identified gaps/challenges and opportunities in taking such leadership and suggests a number of strategic investments and cultural changes; specific recommendations are grouped into two categories, Infrastructure & Operation and Culture.

2. Gaps/Challenges

- Decreasing or stagnant support from the federal and state governments.
- Certain key infrastructures (e.g., containment facilities and greenhouses) are inadequate to support research on many important pathogens and pests.
- Investment in human resources supporting extension programs has been limited relative to that supporting research and education.
- Investment and practices in outreach to the general public about issues that affect plant, animal, and human health have been limited, and mechanisms supporting and coordinating such activities are not well established.
- Although collaboration across units and colleges has been increasing, the main ‘modi operandi’ of the college still center on individual programs, and with the exception of a few areas, research, education, and extension programs are not well integrated as teams/systems.

3. Opportunities

- Efforts to form collaborative networks across units and colleges in anticipation of and response to threats to plant, animal, and human health have been increasing (e.g., Centers for Infectious Disease Dynamics, Molecular Immunology & Infectious Disease, Molecular Toxicology & Carcinogenesis, and Chemical Ecology).
- Physical proximity to key state and federal agencies that are charged to address issues related to plant, animal, and human health and close working relationships with researchers and administrators of such agencies.
- Potential synergy with other colleges (e.g., the Hershey Medical School, EMS, IST, Eberly College of Science, and Engineering) can be capitalized to enhance research, education, and extension programs in the college.
- Certain computational tools and pedagogical/experimental approaches can help us fundamentally transform how we conduct research, education, and extension.
- The college has the capacity to develop innovative educational programs in collaboration with other colleges toward the goal of enhancing human capital supporting national preparedness against natural and deliberate threats.

4. Recommendations

In order for the college to maintain and enhance its core strength and mission in the area of plant, animal and human health, while at the same time creating new strengths and offering new services to the society, investments should be directed mainly to areas that can create synergy across multiple units and programs, offer novel and transformative paradigms and services, and/or quickly become self-sustainable. The focus should be on enhancing or transforming existing human networks and building new ones that include specialists in research, education,

and extension, because well-established human networks whose members work closely together across unit and disciplinary boundaries are essential to building innovative programs. Such networks cannot be formed and become operational overnight in response to a new crisis or funding opportunity; it requires long-term planning and preparation. The college should work to proactively form and support teams to prepare and practice against general classes of potential threats to plant, animal, and human health, so that the college is prepared to rapidly adjust to the emergence of specific threats.

4.1. Infrastructure and Operation

- Enhance strength in extension by strategically and deliberately investing in areas in which extension and research faculty can work closely together to create new services and funding opportunities. Encourage the formation of integrated, research-based extension programs that offer new paradigms and approaches to anticipate and prepare against local, regional, national and international threats to plant, animal, and human health.
- Guide investment in hiring, building facilities, and major equipment purchases based on strategic planning and evaluation that take into consideration the needs and impacts to existing programs, long-term sustainability and maintenance, potential partnerships with other colleges and institutions.
- In addition to better tapping into existing funding sources, the college should actively engage in creating new funding sources by closely working with state and federal funding agencies and other land grant institutions. To this end, the college should actively engage in networking and educating stakeholders in the state and the nation as well as those in other countries in order to enhance the visibility of College programs that protect the plant, animal, and human health of the nation.
- Lead in the development of, and be a major player in, the Center for Animal, Plant and Public Health Interaction (CAPPPI), a new institutional cross-cutting initiative to facilitate integrative research, education and outreach efforts at Penn State.
- Identify areas that are important but have not yet received proper attention (e.g., interactions between environments such as water quality and plant, animal, and human health, alternate methods of disease control/prevention, new tools/mechanisms creating synergy among research, education, and extension) to develop them as our strength.
- Develop post-graduate programs that can place students into areas where gaps in our preparedness exist and good jobs are available (e.g., veterinarians, especially in the areas of livestock and public health, professional certificate/master programs in homeland security).

4.2. Culture

- Continuously cultivate a working/operational environment that is conducive for the formation of interdisciplinary teams within and across colleges by offering incentives such as recognition, seed grant, and favorable annual and P&T evaluations. The preferential hiring of faculty with split appointments and joint seminar programs, workshops, and/or courses may be additional mechanisms for enhancing cross-department and cross-college integration.
- Take advantage of the ability to cross-fertilize fields in enhancing the quality of research, education, and extension programs. This can potentially be done using a systems-within-systems approach (e.g., development of highly visible programs by taking advantage of

strengths in infectious disease across departments, and leveraging host responses across departments, including host immune responses in plants, animals and humans).

- Integrate the enhancement of communication skills as part of all majors to educate students who are able to effectively communicate about complex scientific/social issues with the general public.
- Encourage and facilitate incorporation of international perspectives and cooperation in research, education, and extension programs in the college, as threats to plant, animal, and human health are an inherently global problem and require global cooperation for adequate response.