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## Using 4-H Animal Science Programming to Improve One Health

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## Using 4-H Animal Science Programming to Improve One Health

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*Zoonoses, or diseases that can be transferred between humans and animals, such as variant swine influenza, avian influenza A viruses, and coronaviruses, comprise a large percentage of all newly identified and existing infectious diseases (Centers for Disease Control and Prevention, 2017). As a result, there is an ever-growing need for a One Health approach towards preventing and controlling zoonotic diseases. To better manage these public health risks at the human-animal-environment interface, Maryland 4-H and Maryland Department of Health initiated a statewide, multi-agency collaborative partnership. Through steps taken to collectively develop and implement long-term strategies to prevent future variant influenza outbreaks in Maryland, a valuable One Health partnership was developed. As a result, the Healthy Animals | Healthy YOUTH program, novel influenza, and other zoonotic disease subject matter content was delivered using multiple approaches, including 1) the addition of new content to an already existing online 4-H Animal Husbandry and Quality Assurance program, 2) distribution of 120 resource kits across two states containing a collection of 24 hands-on lessons, resource documents, and supplemental teaching materials, 3) in-person and virtual train-the-trainer sessions, 4) youth workshops, 5) educational and hands-on activity videos, and 6) standardized fair signage for use at animal exhibits.*

*Keywords:* partnerships, zoonosis, 4-H, animal science, zoonotic disease, public health, One Health

### Background

Zoonotic diseases, also termed zoonosis, are caused by the spread of pathogens between animals and people. Such transmission involves bacteria, fungi, viruses, and parasites that can cause mild to severe illness. According to the Centers for Disease Control and Prevention (CDC), “scientists estimate that more than six out of every ten known infectious diseases in people can be spread from animals, and three out of every four new or emerging infectious diseases in people come from animals” (CDC, 2021, para. 3). These include zoonotic diseases such as variant swine flu

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influenza, avian influenza A viruses, and coronaviruses (World Health Organization, 2018). Other commonly recognized examples of zoonotic diseases include Rabies, Salmonella, West Nile virus, Lyme disease, and Ringworm. Over the past decade, zoonotic diseases have been estimated to “cost the global economy \$20 billion in direct economic losses, with another \$200 billion in indirect costs” (World Bank, 2012).

Dating back to its early beginnings in 1902 (National 4-H History Preservation Team, n.d.), the 4-H program has a rich history of facilitating youth engagement with animals through various animal science projects and programs. Consequently, animal science project and program involvement present zoonotic disease transmission risks that can negatively impact livestock and human health. Zoonotic diseases not only put 4-H animal science project participants and their families at risk but also increase the risk of pathogen exposure for Extension professionals and 4-H volunteers who coordinate exhibition events and public spectators attending these events. Livestock diseases, potential outbreaks, and zoonotic disease transmission remind us of the ever-growing need to provide education in disease prevention. This education will be purposefully implemented and emphasized within the 4-H project curriculum.

The One Health approach refers to “the collaborative efforts of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals, and our environment” (World Bank, 2012). The World Health Organization (2017) confirms that collaboration is key to understanding and managing public health risks. At the human-animal-environment interface, a One Health approach improves local and global health security efforts that monitor and control health threats, recognizing that people’s health is closely connected to the health of animals and our shared environment. This same concept can be applied to the field of youth development. Through a One Health partnership, Maryland created a *Healthy Animals | Healthy YOUth* program to expand the educational initiative for One Health. This practice and pedagogy article shares how a multi-state approach to One Health within 4-H Animal Sciences resulted in the development of a new educational program to educate youth on zoonosis.

### **Incorporating One Health into Positive Youth Development and Animal Sciences**

Nationwide, Extension is well-positioned to facilitate the utilization of a One Health approach. However, in the past, Extension as a whole has not always been at the forefront of bringing public health, food system, agriculture, and youth development experts together to address human and animal health concerns (Morgan & Fitzgerald, 2014). A One Health approach encourages the involvement and collaboration of multiple disciplines and organizations. However, within Extension, professionals are typically individualized experts in specialized fields, such as animal sciences, family health and wellness, and youth development.

Despite the clear, practical link between positive youth development, animal science, and public health, little work has focused on connecting these disciplines and bridging the gaps between approaches that improve overall health. Though the effectiveness of human health and well-

being strategies among youth development programs has been empirically shown (Smathers et al., 2019), integration of public health risk prevention strategies among positive youth development has been overlooked in the context of 4-H animal science programs. The process of combining positive youth development, animal science, and public health approaches must be intentional if it is to provide youth with resources, knowledge, and opportunities needed to become successful stewards of agriculture and competent, healthy citizens.

The Maryland One Health partnership was strengthened during the 2017 variant swine influenza outbreak at several county agricultural fairs within Maryland. The Maryland One Health partnership was comprised of the Maryland Department of Health (MDH) and local county health department professionals, Maryland Department of Agriculture (MDA) Animal Health veterinarians, University of Maryland Extension 4-H educators, agricultural fair officials, and influenza subject matter experts at the CDC. Together, a One Health approach was formed and utilized to respond to the variant swine influenza outbreaks collectively. Capitalizing on each agency's expertise, this approach proved beneficial to outbreak response planning and implementation. Afterward, steps were taken to collaboratively develop and implement longer-term strategies to prevent future variant influenza outbreaks in Maryland. The One Health partnership took a proactive approach and developed an educational initiative to bridge the gap between animal and human health. The primary roles of the different members of the partnership are shown in Table 1.

**Table 1. Primary Roles of Maryland One Health Partnership Members**

Group / Organization	Primary Roles
Maryland 4-H Youth Development Program	<ul style="list-style-type: none"> <li>● Develop age-appropriate youth educational content and resources.</li> <li>● Develop train the trainer materials for volunteers and professionals.</li> <li>● Distribute relevant educational content and resources to 4-H audiences and partners.</li> </ul>
Maryland Department of Agriculture Animal Health Program	<ul style="list-style-type: none"> <li>● Prevent and control infections and contagious diseases in livestock and poultry, with particular emphasis on those diseases that threaten public health, endanger food supplies, or threaten the animal industries' economic security.</li> <li>● Develop and enforce requirements for exhibitors for animal exhibitions at fairs and shows.</li> <li>● Develop public service announcements and promote the exchange of expertise regarding safe farming and biosecurity measures, animal slaughtering practices, understanding animal contact, and exposure risks.</li> </ul>
Maryland Department of Health	<ul style="list-style-type: none"> <li>● Utilize subgroup called Center for Zoonotic and Vector-borne Diseases (CZVBD), a Center within the Infectious Disease Epidemiology and Outbreak Response Bureau (IDEORB), or State Public Health Veterinarian.</li> </ul>

Group / Organization	Primary Roles
	<ul style="list-style-type: none"> <li>● Establish functional cross-sector coordination with the state's local health jurisdictions, other state agencies, CDC, healthcare providers, veterinarians, and the general public.</li> <li>● Create a database of local health department professionals for local community collaborations.</li> <li>● Create and disseminate public health messages.</li> </ul>

### Development of Tools and Resources

One of the most effective ways to reduce disease transmission between livestock and people is through biosecurity practices. Such practices are preventative measures taken to minimize the risk of introducing infectious diseases into animal populations. Biosecurity measures also assist in protecting people from disease-causing agents. Within Extension, 4-H youth development programs rely heavily upon adult volunteers to provide hands-on instruction, support, and guidance to youth participants. There are many informational resources on biosecurity practices that target producers, veterinarians, and the public, but resources targeting youth are limited. Best practices around disease prevention are critical within 4-H animal science programs. Still, overall awareness around zoonosis must also exist among all entities and organizations that come together for animal exhibitions at shows and fairs.

In response to the need for age-appropriate biosecurity and zoonotic disease educational resources for youth, Maryland 4-H initiated the *Healthy Animals | Healthy YOUTH* program. Program development was supported through funding from the MDH and a multi-year CDC and U.S. Department of Agriculture/Council for State and Territorial Epidemiologist (CDC/USDA/CSTE) Project Development grant.

Through the *Healthy Animals | Healthy YOUTH* program, novel influenza and other zoonotic disease subject matter content were delivered to youth and adult audiences using multiple approaches, including

- the addition of new *Healthy Animals | Healthy YOUTH* zoonosis educational content to an already existing dual-state online 4-H Animal Husbandry and Quality Assurance program (AH&QA);
- distribution of *Healthy Animals | Healthy YOUTH* education resource kits across Maryland and West Virginia containing a collection of 24 developed, adapted, and adopted hands-on lessons, resource documents, and supplemental teaching materials;
- in-person and virtual train-the-trainer sessions;
- youth workshops;
- educational and hands-on activity videos; and
- standardized fair signage for use at animal exhibits (see Figure 1).

**Figure 1. Healthy Animals | Healthy YOUth**

The addition of new *Healthy Animals | Healthy YOUth* zoonosis education content to the current dual-state AH&QA included adding specific educational content about zoonosis, zoonotic diseases, and biosecurity best management practices to mitigate transmission of diseases. Maryland and West Virginia 4-H and FFA members' online access to this program provides easy accessibility to this information. During 2019-2020, 5,201 youth completed the online Maryland and West Virginia AH&QA program.

The *Healthy Animals | Healthy YOUth* curriculum combines various developed, adapted, and adopted lessons to educate participants on protecting the health of people and livestock through implementing biosecurity practices. Important attributes of this curriculum include

- hands-on, engaging activities,
- applicability to real-life situations, and
- ease of use for facilitators.

Extension faculty and staff identified, developed, adapted, and adopted a broad scope of lessons and activities, targeting essential topics. Sample lesson titles are

- *Painted Hands: Hand Sanitizer and PPE Glove Use,*
- *Down and Dirty with Biosecurity,*
- *Germ Swap,*
- *Routes of Transmission,* and
- *PPE Safe Removal.*

The comprehensive nature of the topics, approaches, and target audiences make the curriculum relevant to a wide range of Extension professionals' research and education work in agriculture, health and family wellness, and youth development.

To provide efficient curriculum accessibility to facilitators and teachers, 120 kits were assembled and distributed in Maryland and West Virginia. The kits included the printed curriculum material and other supplementary resources and materials needed to conduct the hands-on, experiential learning activities in each lesson.

Implementation of train the trainer workshops for the *Healthy Animals | Healthy YOUth* curriculum were initiated in 2019 with continuation in 2020. Four trainings on the *Healthy Animals | Healthy YOUth* curriculum were offered to train 94 Maryland and West Virginia 4-H faculty and staff, Extension volunteers, and community collaborators such as fair officials and animal show chairpersons, both in person and virtually. Access to the curriculum and related resources is provided to trained facilitators on the Maryland 4-H website and the Maryland Department of Health website and similarly focused partnerships across the nation on a CDC-sponsored resource portal.

While this project's primary focus is to educate youth with a consistent message about zoonosis, its impact on health, and how biosecurity plays an important role, educating the public is another component of the program. Educational signage indicating the importance of handwashing in relation to zoonosis and animal/human health was designed. Use of this signage at Maryland fairs and shows provided the public with the message that their health is essential and showed simple steps to protect themselves, such as appropriately washing their hands after exiting a barn.

### Applications

The importance of integrating aspects of public health into Extension programming and other youth development efforts to reduce risky behaviors has been shown (Smathers et al., 2019). Establishing practices, policies, and systems that encourage healthful behaviors allows Extension to incorporate health in ways that go beyond education and make healthy choices more accessible, appealing, and acceptable to youth (Smathers et al., 2019).

It is also critical to explore community-wide and cross-sectoral collaborations to better address emerging issues specifically related to animal agriculture and public health. The Maryland One Health partnership has created needed resources and models a statewide approach to delivering youth-targeted One Health education. This education can be used by professionals regardless of animal science or public health knowledge or background. The Maryland One Health partnership and the *Healthy Animals | Healthy YOUth* program stresses disease prevention using biosecurity practices. This curriculum emphasizes the animal-human-environmental interface to help youth increase awareness of zoonotic diseases, improve understanding of disease transmission routes, and learn how to apply biosecurity measures like handwashing and the proper use and application of personal protective equipment (PPE) to minimize risks for disease transmission. Preliminary evaluations have shown participants increased knowledge of what zoonotic diseases are. Pre-test and post-tests showed an increase in the percentage of youth who responded correctly to identifying the definition of a zoonotic disease from 76.4% pre-test to 90.11% post-

test. Youth are also identifying best biosecurity methods. Pre- and post-tests showed an increase in the percentage of youth who could identify a good bio-security practice, from 79.86% pre-test to 85.19% post-test.

Many of the Healthy Animals | Healthy YOUth program lessons can also be applied to youth in all project areas, not just 4-H animal sciences. For example, the germ transmission activities share a way for all youth to experience and visualize how germs transmit in everyday life. These concepts can apply to projects such as healthy living and cooking, as well as to youth's personal lives when attending public events or other animal encounters. Continuing partnerships with animal health and public health organizations will maintain the flexibility and fluidity to add components to the curriculum and allow access to a wide range of audiences beyond 4-H youth and volunteers.

### Conclusion

Zoonosis is of growing importance in today's society, especially for young people engaged in animal agriculture. Collaboration is the key to understanding and managing public health risks at the human-animal-environmental interface and its influence on improving local and global health security.

During the past two decades, Extension professionals identified zoonotic disease education as an agricultural health and safety topic in need of greater emphasis in adult education programs (Webster, Rogers, & Mariner, 2001). From the national level to the local level, disease surveillance for human and animal health has traditionally been separated. The Maryland *Healthy Animals | Healthy YOUth* partnership and relevant curriculum have aided in bridging the gap between organizations and agencies that previously acted independently when addressing animal health, public health, and youth development issues. Partnerships such as these can strengthen educational efforts and shared knowledge among the partnership's members and mitigate obstacles faced by each to better increase public awareness, no matter their familiarity with animal sciences. Preliminary pilot evaluations have suggested increased knowledge and familiarity with main concepts. Bringing together multiple agencies ensures that youth learn content that is relevant to all sectors of One Health.

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