UNITED STATES ANIMAL HEALTH ASSOCIATION - 2006

RESOLUTION: **27 APPROVED**

SOURCE: COMMITTEE ON PUBLIC HEALTH AND RABIES

SUBJECT MATTER: FUNDING FOR ADITIONAL RESEARCH ON USE OF INFRARED TECHNOLOGY TO DETECT SIGNS OF ANIMAL DISEASES

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DATES: MINNEAPOLIS, MINNESOTA, OCTOBER 12-18, 2006

BACKGROUND INFORMATION:

Detection, surveillance, and monitoring of animal diseases, especially zoonotic diseases, is of paramount importance in the world today. The development of new technology is being constantly sought. If a remote sensing method could be developed that would detect signs of select animal diseases, millions of dollars could be saved by government and private industry.

Infrared thermography is a non-invasive, non-contact diagnostic or screening technique that measures heat emitted from a target surface and displays the information as a pictorial representation. Infrared radiation, which is detected by thermal cameras, is emitted by all objects proportional to their temperature. Medical imaging makes use of the fact that heat is one of the cardinal signs of inflammation, so an increase in body surface temperature may indicate inflammation of tissues close to that point. While thermography does not reveal specific pathologies, it facilitates the localization of increased (inflammation and/or injury) or decreased heat (reduced blood flow or vasomotor tone). The patterns of a thermograph are affected by activities of the tissues, organs, and vessels inside the animal's body and may be unique for a particular disease (i.e., a "signature").

Currently, infrared thermal imagining is used in many different medical applications. The most prominent of these are oncology, including breast cancer (Anbar, 2002), vascular disorders (Lawson et al, 1993), pain (Graff-Radford, et al., 1995), surgery (Devulder et al., 1996), arthritis (Will et al., 1992), ophthalmology (Montoro, et al., 1991), and dentistry (Biagioni et al., 1996), to mention but a few. This technology has also been used in veterinary science in attempting to detect lameness in horses (Eddy et al., 2001) as well as other diseases in horses, including subluxation of vertebra, abscesses, periostitis, and laminitis (Purohit et al., 1980). To a more limited degree, infrared thermography has also been used to detect infectious disease in animals, including bovine viral diarrhea virus (BVDV) infection in young cattle (Schaefer et al., 2004).

Studies conducted by scientists at the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS), National

Wildlife Research Center (NWRC) have provided data that indicated that infrared thermography can be used in an experimental setting to detect raccoons exhibiting clinical (neurological), and possibly prodromal, signs of rabies. They found that the infrared thermal image and temperature of the nose of raccoons correlated with stages of rabies infection. In studies at the Department of Homeland Security's (DHS) Animal Disease Center at Plum Island, New York, scientists also found that signs of foot-and-mouth disease (FMD) in cattle and pronghorn antelope could be detected by infrared cameras. In these studies, scientists found that infrared cameras could detect the signs in feet of pronghorn antelope before visual lesions were evident. Studies are currently underway to attempt to detect bovine tuberculosis in experimentally infected white-tailed deer.

The use of infrared thermography to detect additional diseases and in other animal species may hold promise. Signs of animal diseases, especially those presenting with external signs that may also be detected by infrared, are classical swine fever, African swine fever, rinderpest, screwworm infestations, vesicular stomatitis and anthrax, to mention but a few. The detection of animal diseases by remote infrared thermography would add another tool in the arsenal in combating both domestic and foreign animal diseases. We believe the use of infrared thermography to detect diseases in animals is in its infancy and, after additional research, will prove invaluable in the areas of both human and animal health.

RESOLUTION:

The United States Animal Health Association (USAHA) urges the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) and the Department of Homeland Security (DHS), Science and Technology Directorate (STD) to seek funding for research on the use of infrared thermography to detect signs of disease in both domestic and wild animals. Funding for the continuation of this research will support studies: 1) on the use of infrared technology to detect signs of infection in animals on a number of emerging diseases of importance to domestic animal and human health; 2) for the application of this technology to detect, monitor, control, and possibly prevent the introduction of foreign animal diseases into the United States; and 3) to respond to emergency animal disease outbreaks in support of efforts of USDA and DHS.

RESPONSE:

United States Department Of Agriculture (USDA), Animal And Plant Health Inspection Service (APHIS), Wildlife Services (WS)

Scientists at our National Wildlife Research Center have been involved in preliminary evaluation of infrared technology to detect signs of wildlife diseases including rabies, bovine tuberculosis, and foot and mouth disease. To this end, we have successfully used infrared technology to detect signs of rabies infection in experimentally infected raccoons, and have conducted some pilot studies with the APHIS/Veterinary Services program to develop the use of this technology to detect signs of foot and mouth disease in wild and domestic ungulates, including mule deer,

pronghorn antelope and cattle at the Department of Homeland Security/Plum Island Animal Disease Center in New York. The use of infrared technology, if effectively developed, could lead to early detection, quick screening, and rapid isolation of infected animals, which would help reduce the economic impact, and eventually help control the spread of important diseases. We will continue to support the development of new technology for the effective control of wildlife diseases.

Department Of Homeland Security (DHS), Science and Technology Directorate

DHS will continue to examine new technologies or improved versions of technology that may show promise for use with early disease detection or for use during an outbreak or the recovery phase of an outbreak. DHS will continue to work cooperatively with USDA-APHIS-VS and WS to assist in technology evaluation. This is done through a process that prioritizes our activities with in a fixed budget. Currently there are still a number of significant questions around the effective use of infrared-based detection: e.g. the signatures are non-specific and can arise from a number of infections or even over-crowding; and remote detection of such signals would be extremely difficult because of the background clutter from other elements in the scene. Given those considerations, we believe that it is a higher priority to continue to invest in veterinary countermeasures and diagnostics that are specific to foreign animal diseases of concern. DHS will continue to lend support for such trials as those previously performed at Plum Island Animal Disease Center as part of our continuing support of USDA-APHIS-VS and WS in evaluating new technologies