Medical-Veterinary-Health Informatics Center

Over the past decade, faculty members in the School of Veterinary Medicine (SVM) at Louisiana State University have successfully employed Geoinformatics to study, predict and control diseases in a variety of species, including humans, and ecologically. SVM faculty have had mixed success in solving disease and, conversely, health issues because of disease-s multifaceted nature that requires a multi-disciplinary approach which includes, geography, epidemiology, geographic information system (GIS), mathematical disease modeling, statistics (especially spatial statistics), risk analysis, remote sensing capabilities, environmental modeling and information support structure support.

Recent catastrophic events--reemergence of "controlled" diseases (tuberculosis and underweight neonates, emergence of new diseases (BSE), invasion of devastating pathogens (FMD and West Nile), national food health safety threats (*E. coli* O157:H7), destruction initiated by global weather changes, and terrorist World Trade Center havoc—emphasize the need for non-traditional approaches health/disease thinking.

These days we are facing risks that we did not a few weeks ago. The recent events demonstrate that earlier discussions on the dangers of bioterrorism that were more theoretical than probable must be reconsidered. A terrorist group that successfully organized four separate but coordinated attacks involving some five years of planning and training must be taken very seriously. At the same time we have all the disease and climate risks that existed before.

In many areas, more animals than humans might be exposed to the agents and for most animals the effects of terrorist agents are similar to human reactions. It is highly likely that terrorists will target domestic livestock and animal populations, because the economic impact would be enormous. Capturing emergency health events in animal populations in state and local areas should increase the early detection of a terrorist event or natural outbreak of a foreign animal disease and reduce morbidity and mortality in animals as well as humans or the environment. IT is vital for efficient and rapid control of disease and health emergences.

Presently, The World Health Organization (WHO) Collaboration Center in Remote Sensing and the Geographic Information System Network in Snail-borne infections (GNOSISGIS, www.GnosisGis.org) are located in SVM. In less formal arrangements, SVM faculty are creating interactive Geoinformatic-disease-data bases that may be used in disease surveillance, monitoring and control of epidemics, temporal-spatial analysis of disease clustering, risk analysis and disease modeling. Dr. Martin Hugh-Jones is the Director of the WHO Remote Sensing Collaboration Center. He is involved in Geoinformatic projects on anthrax control, bioterrorism, GIS database associating *Vibrio vulnificus* and oyster bed location, Eastern Equine Encephalitis and infant mortality with birth weight and spatial demographics. Dr. John Malone is the chair of GnosisGIS workgroup. He is involved in creating a GIS data base looking at the effect of the Three Gorge Dam on water-borne disease in China, teaching a GIS training and exchange

program in SVM, developing climate prediction models for fasoliasis in ruminants and an interactive GIS map data base for Sub-Saharan Africa. Dr. Alex Thompson is working with the National Hansen Disease Programs to create a GIS database that will be used to look at the varying geographic and environmental tends reported in the occurrence of leprosy worldwide. Electronic maps and an interactive tabular data base linking incidence of leprosy in man and armadillos will be combined with demographic, hydrological, climatic, geographical and vegetative data to determine spatial-temporal disease clustering. He has participated in GIS-Remote Sensing projects looking at climate and visceral leishmaniasis in Brazil.

The ultimate aim of this proposal is to build a LSU "Center@ that fuses multiple academic disciplines that individually solve disease-health threats into a group that creates a final product, which combines the strengths of each discipline (GIS, geography, epidemiology, mathematical disease modeling, spatial statistics, remote sensing and environmental studies) and supplements each discipline's inherent weaknesses. Examples that the SVM faculty have initiated and could further benefit from the "Medical-Veterinary-Health Informatics" approach are:

A. *Mississippi Delta Environmental Health and Geospatial Science Center* (grant pending) that 1) defines interactions of the environment and diseases of public health significance by use of computer-based mapping, spatial technology and satellite remote sensing; 2) enhances health delivery systems, where, preventive education and hazard mitigation that will lead to improved public health in the Mississippi Delta region of the United States; 3) research laboratories linked via the internet, will provide environmental resource data, health infrastructure data and training/support programs; 4) it will house a ›minimum medical geographic information system database‹ (GIS) collectively created by researchers at the LSU Medical Center in New Orleans, the School of Veterinary Medicine and earth/environmental basic scientists in the LSU Departments of Geography and Anthropology and Geology and Geophysics.

B. *A Farm GIS-Health Center* that establishes a Louisiana (hopefully a national) system for GIS-mapping every agricultural holding. The primary thrust for this is certainly emergency disease control. It is abundantly clear to all involved that such databases are an extraordinary national resource for maximizing the benefits of data common to a range of agricultural and wildlife departments and minimizing confusions through them maintaining, or not, duplicate data at varying levels of completeness and efficiency. These benefits also extend to academia, which call on such GIS data for teaching and research.

C. *A Web based Louisiana Veterinary Practice Surveillance Program* that will develop and coordinate a Web based veterinary-practice-surveillance net. The Net will collect, monitor and facilitate veterinary practitioner diagnostic laboratory consultations and report suspicious disease events to designated bioterrorist diagnostic laboratories and local, state or federal outbreak-investigation units. The network (a prototype system that may be used throughout the United States in both animals and humans) will consist of

Louisiana veterinary practices in cooperation with LSU-SVM. These surveillance techniques will determine if there is an epizootic/epidemic disease event and if the agent or vector is native or imported.

D. *Dr. Daniel Scholl is developing Markov Chain Transition Model* techniques to evaluate and predict disease status changes of Leprosy in armadillos and Bovine Immunodeficiency Virus in Cattle. Dr. Thompson is using GIS and Risk Analysis to evaluate factors (social, political and communication) that affected Foot and Mouth (FMD) eradication procedures in the 2000 South African FMD outbreaks.

The economic applications of the Medical-Veterinary-Health Informatics Center run the gamut from private industry to commercial agriculture to government (state, local and national). For example, Dr. Hugh-Jones is involved with commercial enterprise working for McDonalds Inc. that is looking at following meat from farm animals right to the fork. Dr. Malone has climate forecast contacts with pharmaceutical companies and agriculture consultants wishing to use his procedures to estimate anthelmintic use in agriculture. An example of a private entrepreneurial spin off is Mud Springs Inc., a Texas consulting firm using agro-climate forecasts to help agriculture firms, both nationally, and, with USAID, internationally. The economic advantages (Private, Public, Individual and Community) are obvious with early disease/disaster detection and operational programs. There is expanding use of GIS for hospital records/health care delivery systems.

The Medical-Veterinary-Health Informatics Center requires a mathematical disease modeler, spatial statistician and a risk analysist to compliment the current SVM health scientists with major IT involvements. Further synergism from these academic endeavors occurs when combined with related campus efforts in Geography & Anthropology, Applied Statistics, Costal Studies, Environmental Studies, Mathematics and Computer Science Departments. Several web-based servers will be required, and, of course, highly technical support personnel will be needed.

The Medical-Veterinary-Health Informatics Center comprised of several distinct academic specialists but all interconnected because of the complex nature of health or conversely disease is needed to address the complex nature of health and disease is needed to overcome the limits stemming from each discipline’s approach. Increased contact and collaboration with the Geography and Anthropology, Coastal Science, CADGIS, Civil Engineering and Applied Statistics Departments would help the SVM staff move from mixed results to success in supplying novel disease/health solutions. Input from the above campus units in the cultural, spatial and environmental non-disease aspects of disease would really be helpful. The extra-departmental structure will encourage overcoming the limits imposed by traditional departmental thinking. Better use of information hardware, software and technological support personnel will promote efficiencies not seen in the traditional department structures.