Livestock farming is of a high priority in many South-east Asian countries. The farmed animals — whether for local consumption or for the export market — must satisfy high output rates, as well as high standards of meat quality. Farmers in the rural countries of South-east Asia often engage in the husbandry of more than one animal type using poor farm management practices. As a result, farms are often plagued by infectious diseases, which can cause huge economic losses due to high mortality rates, reduced feed efficiency and condemnation of animals at processing.

In the past decade, biotechnology in agriculture has had a great impact on the farming industry. Most South-east Asian countries, however, lack the expertise and biotechnology required for the management of farm animals. The Institute of Molecular Agrobiology (IMA), an affiliate to the National University of Singapore, is one of the few institutes in South-east Asia with a program engaged in animal disease research. Although Singapore is not involved in animal husbandry, it is located in the hub of South-east Asia where agri-businesses form a major sector of the regional economies. It also has a good international network and has the added advantage of a well-educated work force. The Animal Health Biotechnology division of IMA integrates basic scientific research with advances in biotechnology and is thus dedicated to discovering, developing and marketing products that improve the health and productivity of food animals within South-east Asia. Veterinary visiting scholars and graduate students, scientists and post-doctoral fellows in this team who have been trained in the United States, China, England, Singapore, Switzerland and Taiwan are researching and developing preventive medical technologies and strategies to control many of the respiratory, gastrointestinal and reproductive diseases in poultry, swine, cattle and sheep. The IMA has a well-designed animal house and fully equipped high technology laboratories to meet the stringent demands of this research field.

The key to success in the fight against diseases depends on good diagnostic capabilities and preventive measures, which will stop the spread of disease in highly intensive livestock farming. Current diagnostic testing has not kept up with the magnitude of infectious disease in the livestock industry. It is not feasible to test large numbers of animals accurately and economically for different diseases. Veterinary vaccines are not considered adequate in potency and certain vaccines display side effect problems in animals. The goal of the Animal Health Biotechnology unit at IMA is to construct safe, stable and cost-effective vaccines for animal diseases which provide long-term efficacy by
instigating cell-mediated and humoral immunities, and to develop tests which will differentiate infected animals and those vaccinated with genetically engineered vaccines. Emphasis is placed on the development of rapid ‘on the spot’ diagnostic tests which are economical and easy to use. This will benefit producers, veterinary practitioners, agri-businesses and regulatory agents.

Currently, the unit is involved in the production of antigenic and immunogenic recombinant proteins which can be used for the detection of antibodies from pathogen infected animals and the development of genetically engineered vaccines include recombinant subunit vaccines, recombinant live vaccines (gene-deleted vaccines), recombinant viral vector vaccines and DNA vaccines. All vaccines will include a carrier marker test system to enable discrimination between antibodies formed due to vaccination or infection, which will help to deduce the status of farm animals.

The Animal Health Biotechnology division has highlighted the pathogens Salmonella enteritidis, porcine reproductive and respiratory syndrome virus (PRRSV), foot and mouth disease virus (FMDV), Escherichia coli strain OH157:H7 (E. coli OH157:H7) and Mycoplasma hyopneumoniae (M. hyopneumoniae) as candidates for the development of diagnostics and for vaccine trials. FMDV, a contagious viral disease of swine which spreads by airborne transmission, caused an outbreak in 1997 in Taiwan, prompting an indefinite ban on pork exports. It has thus been important to identify FMD-free countries such as Australia, Indonesia, Japan, Korea and Singapore to allow imports and exports. PRRSV is the most serious disease of swine herds throughout the world, and leads to reproductive failure and respiratory problems in pigs of all ages, while M. hyopneumoniae is the causative agent of chronic pneumonia in swine. E. coli OH157:H7 is an emerging cause of foodborne illness associated with eating undercooked, contaminated ground beef. E. coli infection often leads to bloody diarrhea and severe kidney failure. It is hoped that the research conducted by the Animal Health Biotechnology division of the IMA will improve the status of diagnosis techniques and the prevention of animal diseases. This applied technology can then be disseminated to livestock breeders in the region with the aim of reducing the occurrence of animal diseases and boosting the profits in this fast growing sector of the economies of South-east Asia.

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