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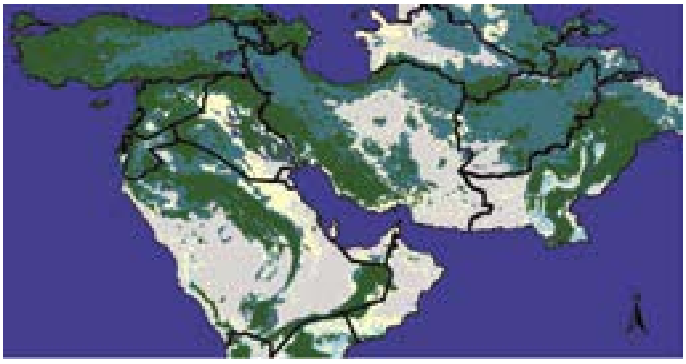
INSIDE

SEVERE ACUTE RESPIRATORY SYNDROME

19 June 2003 marked 100 days from the World Health Organization (WHO) alert issued in response to an alarming epidemic in humans that had broken out in Hong Kong Special Administrative Region, China. Now that the disease seems to be on the wane, it is an opportune time to review what happened. In retrospect, as early as November 2002 cases of an atypical acute respiratory disease of unknown aetiology were starting to occur in Guangdong Province in southern China. The epidemic picked up pace from January 2003, and was at its height from March to May 2003. Infection and disease spread across the world, highlighting the extent of international travel. The countries most seriously affected were China, Viet Nam and Canada (see page 2).

CLARIFYING DISEASE SPREAD IN THE EURASIAN RUMINANT STREET

The recent incursions of foot-and-mouth disease (FMD) and other epizootics into Western Europe have demonstrated the need for adequate livestock data to support epidemiological analysis and to define control strategies. In most European Union (EU) countries, analysis is now enhanced by the availability of georeferenced animal identification and registration data and topographical digital charts, which go down to the level of individual farms (see page 19).



Seasonal grazing availability in 2003
Source: FAO.

GLOBAL FRAMEWORK FOR THE PROGRESSIVE CONTROL OF FMD AND OTHER TRANSBOUNDARY ANIMAL DISEASES

The objective of the joint FAO/International Office of Epizootics (OIE – also known as the World Organisation for Animal Health) initiative entitled Global Framework for the Progressive Control of Foot-and-Mouth Disease and Other Transboundary Animal Diseases (GF-TADs) is the effective prevention and progressive control of transboundary animal diseases worldwide. The goals of this initiative are to safeguard the livestock industries of developed and developing countries from the repeated shocks of infectious disease epidemics, to improve food security and incomes in developing countries, and to promote safe trade in livestock and animal products at national, regional and international levels (see page 15).

This issue covers the period January to June 2003.

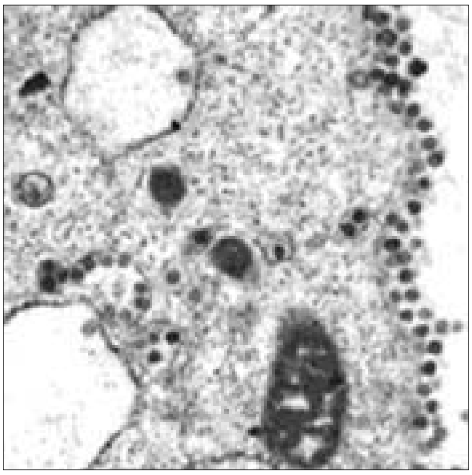
NEW AND EMERGING DISEASES: TWO NEW ZOONOSES FOR WHICH THE WORLD WAS NOT PREPARED

Severe acute respiratory syndrome (SARS)

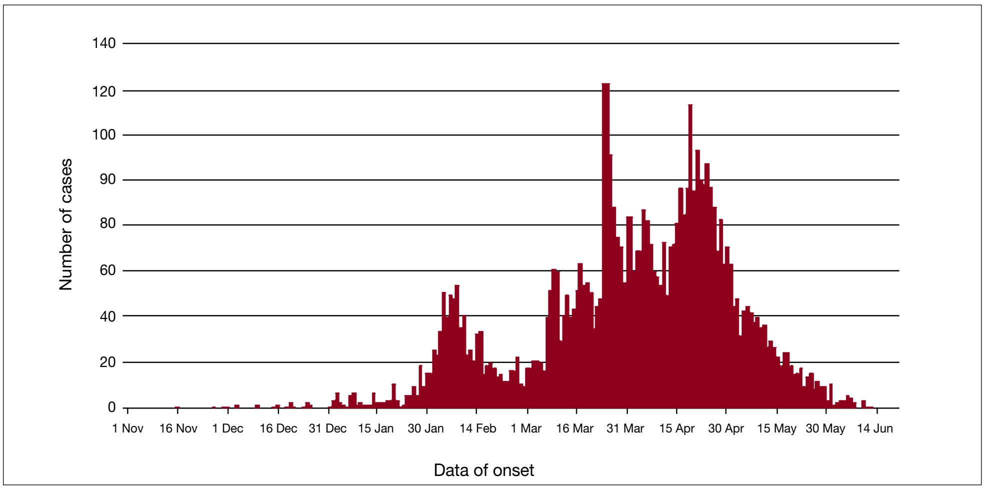
19 June 2003 marked 100 days from the World Health Organization (WHO) alert issued in response to an alarming epidemic in humans that had broken out in Hong Kong Special Administrative Region, China. Now that the disease seems to be on the wane, it is an opportune time to review what happened.

In retrospect, as early as November 2002, cases of an atypical acute respiratory disease of unknown aetiology were starting to occur in Guangdong Province in southern China. The epidemic picked up pace from January 2003, and was at its height from March to May 2003. Infection and disease spread across the world, highlighting the extent of international travel. The countries most seriously affected were China, Viet Nam and Canada.

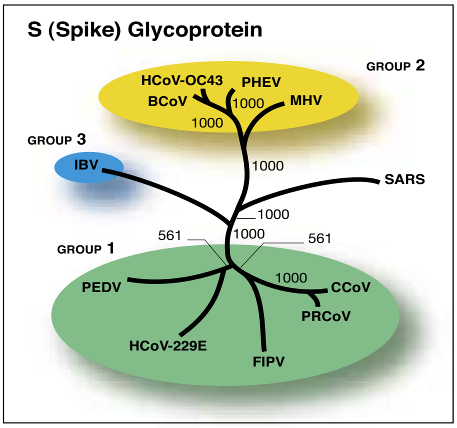
Uninformed conjecture that the virus originated in farmed livestock, combined with conspiracy theories about the large-scale "hiding" of information, caused alarm. This threatened to have a severe impact on trade, food consumption patterns, tourism, and commerce in general. On 5 May, FAO issued a press release in the form of an interview on business and tourist travel to inform member countries that there was "no evidence that SARS stems from farm animals". There is no reason to amend this information. (The FAO press release is available at http://www.fao.org/english/newsroom/news/2003/17263-en.html.)



SARS coronavirus particles budding from the membrane of an infected cell
Source: WHO.



Probable cases of SARS worldwide, by date of onset (n = 5 923) 1 November 2002 to 16 June 2003*
* Does not include 2 537 probable cases for which no onset dates are available.
Source: Ministry of Health, China; WHO.



Phylogenetic analysis of SARS coronaviruses based on sequencing of the S-glycoprotein*

* Analysis of other viral proteins demonstrates a similar relationship.
Source: Marra *et al*., 2003.

The causative virus was soon identified as a coronavirus, and it was characterized by early May. The results indicate that the SARS coronavirus is not related closely to any of the previously characterized coronaviruses but forms a distinct group within the genus *Coronavirus*. It is approximately equidistant from all previously characterized coronaviruses, just as the existing groups are all equidistant from one another. It was concluded that: "the genetic distance between the SARS coronavirus and any other coronavirus in all gene regions implies that no large part of the … genome was derived from other known viruses. The … genomic sequence does not provide obvious clues concerning the potential animal origins of this pathogen"; and that: "The genome of SARS-Coronavirus has several unique features that could be of biological significance. The short anchor of the spike-protein, the specific number and location of small open reading frames (ORFs), and the presence of only one copy of the PLP^{pro} provide a combination of genetic features that readily differentiate this virus from previously described coronaviruses" (Rota *et al*., 2003).

Similarly, Marra *et al*. (2003) concluded: "Although morphologically a coronavirus, this SARS virus is not more closely related to any of the three known classes of coronavirus, and we propose that it defines a fourth class of coronavirus (group 4) and that it be referred to as SARS-Coronavirus. Our sequence data do not support a recent interviral recombination event between the known coronavirus groups as the origin of this virus, but this may be due to the limited number of known coronavirus genome sequences. Apart from the s2m motif located in the 3'UTR, there is also no evidence of any exchange of genetic material between the SARS virus and non-Coronaviridae. These data are consistent with the hypothesis that an animal virus for which the normal host is currently unknown recently mutated and developed the ability to productively infect humans. There also remains the possibility that the SARS virus evolved from a previously harmless human coronavirus. However, preliminary evidence suggests that antibodies to this virus are absent in people not infected with SARS-Coronavirus, which implies that a benign virus closely related to the [SARS coronavirus] isolate is not resident in humans."

WHO carried stories in May that scientists had found a closely related coronavirus infecting a number of viverid and mustelid carnivores

Following the trail, WHO carried stories in May that scientists had found a closely related coronavirus infecting a number of viverid and mustelid carnivores (masked palm civets, raccoon dogs and ferret badgers), which were on sale in markets. For this reason, they believed that the SARS virus originated from these wild animals. However, elements of the story cast doubt on these animals as the source of the SARS coronavirus. A high proportion of the animals tested were found to be excreting virus, and therefore acutely infected. This suggested that they had acquired infection recently and so were most likely to have picked it up in the market or at assembly points. The true origin of the coronavirus could have been any of a wide spectrum of animals or animal products being sold through markets; it could even have originated in humans. The animals mentioned are distributed primarily in low-altitude mountainous areas in tropical and subtropical regions. Many are reared in captivity and can be purchased live at animal markets and restaurants in the cities of Guangdong Province. Others might be caught in the nearby mountains, and one report claims that trade in these animals from Viet Nam has developed over the last two years.

The virus found in the civet cats (Paguma larvata) is not identical to the coronavirus found in SARS patients; the human virus has 29 fewer nucleotides in the N-protein gene. According to the Chinese People's Daily newspaper, Guan Yi, a doctor at the University of Hong Kong's Department of Microbiology, said: "We have charted a complete genetic map of the SARS-like coronavirus detected in the Himalayan palm civet, which shares 99.8 percent of the genetic code of the human SARS coronavirus."

In an interview reported in The Scientist, Dr Klaus Stöhr, director of WHO's global SARS laboratory network, said: "The human virus has a deletion. We think the N-protein is attached to the interior of the virus envelope, but our knowledge about this is schematic. We don't know what the protein is doing." The sequence of the animal virus was compared with 60 sequences of human SARS virus being held in a library to which the Chinese researchers have access. "With the exception of … 29 nucleotides, they were identical," said Stöhr. "But there was one human virus which didn't have this deletion. This was one called 'GZ1'. But we don't know more about that sample, where it came from, what the person had when he became ill – we have no clue what it means at present."

Transmission occurs readily from droplets exhaled from the respiratory tract of infected people. However, the virus can survive for days in human diarrhoeic excreta, a fact that was possibly involved in the explosive development of outbreaks in some situations. Epidemiological evidence collated by WHO indicated that infections were primarily nosocomial (acquired in hospital), and – despite initial fears – very few cases were acquired during air travel. Thus, the key to control was realized to be improving the biosecurity and sanitation procedures surrounding patients admitted to hospital. Very few transmission events (fewer than 40) occurred during air travel. Data reported on the WHO network show that all the six index cases from four cities in Guandong Province had either eaten or dealt with wildlife, particularly snakes, ten days before they fell ill. Stöhr went on to say: "We don't know what the snakes mean, but broadly this appears to be another piece fitting into the pattern."

Evidence is now emerging that there may have been many subclinical infections with SARS coronavirus during the epidemic of acute disease.

FAO assisted its sister agency in attempting to gather information on livestock diseases in China that could provide possible clues as to the origin of SARS. To date, no such connection has been ascertained

During February, FAO assisted its sister agency in attempting to gather information on livestock diseases in China that could provide possible clues as to the origin of SARS. To date, no such connection has been ascertained.

WHO convened a Global Conference on Severe Acute Respiratory Syndrome from 17 to 18 June 2003 in Kuala Lumpur. The FAO Emergency Prevention System for Transboundary Animal Diseases (EMPRES) was represented by Dr Laurence Gleeson of the Australian Animal Health Laboratory (AAHL). The AAHL is a high-biosecurity laboratory linked to FAO–EMPRES as a collaborating centre.

Clearly, much remains to be understood about this virus and its related disease. The description given here may need to be amended in the near future as additional virological, immunological and epidemiological knowledge accrues.

For more information, see: http://www.who.int/csr/sars/en/index.html; and: http://www.cdc.gov/ncidod/sars/.

References

Marra, M.A., Jones, S.J.M., Astell, C.R., Holt, R.A., Brooks-Wilson, A., Butterfield, Y.S.N., Khattra, J., Asano, J.K., Barber, S.A., Chan, S.Y., Cloutier, A., Coughlin, S.M., Freeman, D., Girn, N., Griffith, O.L., Leach, S.R., Mayo, M., McDonald, H., Montgomery, S.B., Pandoh, P.K., Petrescu, A.S., Robertson, A.G., Schein, J.E., Siddiqui, A., Smailus, D.E., Stott, J.M., Yang, G.S., Plummer, F., Andonov, A., Artsob, H., Bastien, N., Bernard, K., Booth, T.F., Bowness, D., Czub, M., Drebot, M., Fernando, L., Flick, R., Garbutt, M., Gray, M., Grolla, A., Jones, S., Feldmann, H., Meyers, A., Kabani, A., Li, Y., Normand, S., Stroher, U., Tipples, G.A., Tyler, S., Vogrig, R., Ward, D., Watson, B., Brunham, R.C., Krajden, M., Petric, M., Skowronski, D.M., Upton, C. & Roper, R.L. 2003. The genome sequence of the SARS-associated Coronavirus. *Science*, 300: 1399–1404. (Originally published in *Science Express* as 10.1126/science.1085953 on 1 May 2003)

Rota, P.A., Oberste, M.S., Monroe, S.S., Nix, W.A., Campagnoli, R., Icenogle, J.P., Peñaranda, S., Bankamp, B., Maher, K., Chen, M., Tong, S., Tamin, A., Lowe, L., Frace, M., DeRisi, J.L., Chen, Q., Wang, D., Erdman, D.D., Peret, T.C.T., Burns, C., Ksiazek, T.G., Rollin, P.E., Sanchez, A., Liffick, S., Holloway, B., Limor, J., McCaustland, K., Olsen-Rasmussen, M., Fouchier, R., Günther, S., Osterhaus, A.D.M.E., Drosten, C., Pallansch, M.A., Anderson, L.J. & Bellini, W.J. 2003. Characterization of a novel Coronavirus associated with severe acute respiratory syndrome. *Science,* 300: 1394–1399. (Originally published in *Science Express* as 10.1126/science.1085952 on 1 May 2003)

Monkeypox

Monkeypox is a rare viral disease caused by* Monkeypox virus*, which belongs to the orthopoxvirus group of viruses occurring in Central and West Africa

In June 2003, a bizarre sequence of events resulted in the appearance of cases of monkeypox virus in humans in the United States of America. This was the first time that the virus had been reported outside the African continent.

Monkeypox is a rare viral disease caused by *Monkeypox virus*, which belongs to the orthopoxvirus group of viruses occurring in Central and West Africa. It is called "monkeypox" because it was first isolated in 1958 from laboratory monkeys. Blood tests of animals in Africa later found that other types of animals had experienced monkeypox virus infection. Scientists also recovered the virus that causes monkeypox from an African squirrel. These types of squirrel might be the common host for the disease, although rats, mice and rabbits can be infected experimentally. Monkeypox was first reported in humans in 1970, and it is an important differential diagnosis for smallpox. The virus does not usually transmit well between humans, although such transmission has featured in recent outbreaks in Africa.

The following notes have been prepared from a collation of newspaper and other media articles; they are believed to be substantially correct.

The virus appears to have been introduced into Wisconsin, the United States, in a consignment of Gambian giant rats (*Cricetomys* sp.) imported from West Africa for the pet trade. There appear to be few restrictions on such trade other than those regarding the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) legislation. It is believed that the rats infected prairie dogs (*Cynomys* sp.) in pet shops/markets, and that the dogs then passed the infection on to their owners, often via bites. As of 18 June 2003, a total of 87 cases of monkeypox had been reported to Centers for Disease Control and Prevention (CDCs) in the United States: Wisconsin (38), Indiana (24), Illinois (19), Ohio (4), Kansas (1), and Missouri (1). Of the 75 patients for whom data were available, 20 were admitted to hospital. Most patients were not seriously ill; some were admitted to facilitate proper isolation. Most had had direct or close contact with wild or exotic mammals such as prairie dogs. In one instance, 28 children attending a day-care facility in Indiana were potentially exposed to two prairie dogs that subsequently became ill and died; 12 children reported handling or petting the prairie dogs, and 7 subsequently became ill with symptoms consistent with monkeypox infection.

Trace-back investigations of animals are ongoing to identify how monkeypox virus entered into the United States

Trace-back investigations of animals are ongoing to identify how monkeypox virus entered into the United States. Preliminary results have determined that an animal vendor in Wisconsin sold prairie dogs to the index patient in Wisconsin; this vendor had obtained prairie dogs from an animal vendor in Illinois, who had housed prairie dogs and Gambian giant rats in close proximity.

Because Gambian giant rats are often imported from regions of Africa where monkeypox is endemic, trace-back investigations of the Gambian giant rats were initiated. These investigations identified a shipment of animals from Ghana, which included Gambian giant rats that were delivered to a Texas animal importer on 9 April 2003. These Gambian giant rats were sold on to an Iowa animal vendor on 15 April 2003, who then supplied them to another distributor. The shipment of animals from Ghana contained about 800 small mammals of nine different species, including six genera of African rodents that might have been the source of introduction of monkeypox. These rodent genera included rope squirrels (*Funisciurus* sp.), tree squirrels (*Heliosciurus* sp.), Gambian giant rats, brushtail porcupines (*Atherurus* sp.), dormice (*Graphiurus* sp.) and striped mice (*Hybomys* sp.). Laboratory testing of animals from the 9 April 2003 importation from Africa is under way to determine which, if any, of the animals might have introduced the virus into the United States.

On the basis of the epidemiological link with the shipment from Ghana, trace-forward investigations have been initiated to locate the animal vendors and owners who purchased imported African rodents from the 9 April 2003 shipment, or prairie dogs from linked distributors after 15 April 2003. In addition to routine sales by animal vendors, animals are also sold or traded at "swap meets" (gatherings of animal traders, exhibitors and buyers). Investigation of one distributor revealed that infected prairie dogs from this animal vendor might have been sold or traded to unidentified buyers at swap meets in the United States, in particular at: Schaumburg, Illinois, on 20 April 2003, 3 May 2003 and 18 May 2003; Indianapolis, Indiana, on 27 April 2003 and 18 May 2003; and Columbus, Ohio, on 19 April 2003. In addition, another distributor sold infected prairie dogs at a swap meet in Wausau, Wisconsin, on 11 May 2003. In several instances, it has been impossible to identify the buyers. Invoices and other records are incomplete for many of these sales, especially those transacted at swap meets.

In order to calm fears that a large epidemic may develop, smallpox vaccine could be issued for use in people who are at high risk.

For more information, see: http://www.cdc.gov/ncidod/monkeypox/index.htm.

CONTAGIOUS BOVINE PLEUROPNEUMONIA

Contagious bovine pleuropneumonia vaccines

François Thiaucourt, International Cooperation Centre of Agricultural Research for Development, Department of Breeding and Tropical Veterinary Medicine (CIRAD/EMVT), Montpellier, France

Contagious bovine pleuropneumonia (CBPP) vaccines have often been the subject of debate, possibly more so than any other type of bacterial vaccine. These debates became more pronounced when the T_1SR strain of vaccine did not seem to induce sufficient protection after the reintroduction of CBPP into Botswana (Amanfu *et al.*, 1998) and East Africa (Masiga, Domenech and Windsor, 1996).

The difficulty with the use of CBPP vaccines is that two different issues are sometimes confused with each other: the efficacy of the vaccine itself, and the efficient conduct of a vaccination campaign. The first issue can be assessed in controlled experiments provided that all the parameters are clearly identified and analysed. The second is far more difficult, and therefore also more controversial, because the efficiency of a vaccination campaign depends not only on the intrinsic quality of the vaccine itself but also on the strategy and logistics for implementation of the vaccinations.

The success of a vaccination campaign depends on careful planning

Therefore, the success of a vaccination campaign depends on careful planning. The campaign must be based on accurate scientific data concerning the vaccine itself and the epidemiology of the disease in order to define a strategy that fits the defined objectives. It must also include careful planning of the logistics for implementing that strategy, and must take the "human factor" into account by ensuring that the cattle owners who are beneficiaries of the vaccinations are collectively well aware of the strategy and agree with its aims and methods. The possibility of post-vaccinal reactions following the application of CBPP vaccine must be explained to cattle owners, or they may refuse subsequent vaccination campaigns.

Concerning the CBPP vaccines themselves, questions about the efficacy of the T_1SR vaccine were raised in the mid-1980s, when a vaccination campaign in Botswana failed to prevent the spread of the disease. As this type of vaccine was thought to be efficient (Provost *et al.*, 1987) and there did not seem to be a flaw in the vaccination strategy, it was concluded that there was something wrong with the vaccine strain itself.

PHOTO: FAO

Animal attendant vaccinating against CBPP

Consequently, FAO advocated the use of vaccine strain $T_1$44 and a grand parental stock produced by the Pan-African Veterinary Vaccine Centre, which could be distributed to CBPP vaccine producers. It was believed that the apparent lack of protection from T_1SR might have been the result of a laboratory error in the manipulation of the strain, leading to the misidentification of what was actually another vaccinal strain, KH3J-SR. At that time, there was no laboratory technique for the specific characterization of the vaccine strain. However, since then, a specific polymerase chain reaction (PCR) test has been developed. This PCR test has demonstrated that there was no misidentification and that the vaccine strain used in Botswana really was T_1SR (Lorenzon *et al*., 2000). Another possible explanation for the lack of potency of the CBPP vaccines could be that a genetic drift occurs during multiple passages *in vitro* or cloning procedures, resulting in the selection of variants that are less immunogenic than the original vaccine seed stock (Rosengarten and Yogev, 1996). However, there is no laboratory technique for determining the potency of a vaccine seed stock.

Producing CBPP vaccine in conformity with the standards of the International Office of Epizootics (OIE) (Lefevre, 2000) is the only way to ensure the potency of successive batches. Lack of protection from a vaccine strain could also be the result of modifications in the pathogenic strains themselves. In fact, T_1 vaccine strains have been used for decades (Sheriff and Piercy, 1952), and pathogenic strains might have evolved in order to escape the immune response triggered by the vaccine. Such an evolution has already been observed *in vitro* for some mycoplasmas (Le Grand *et al*., 1996). Previous vaccine efficacy trials were performed in Africa with a pathogenic strain from Australia, the Gladysdale strain (Masiga and Windsor, 1974), under the assumption that *Mycoplasma mycoides* subsp. *mycoides* small colony variant (*Mmm*SC) strains were very homogeneous. Since then, it has been shown that there is actually great genetic diversity among the pathogenic strains of *Mmm*SC circulating in Africa (Lorenzon *et al*., 2003). Such diversity may have been responsible for a lack of protection from the vaccine strain in the Botswana outbreak.

It was decided to perform a number of vaccine efficacy trials in different regions of Africa and to test the efficacy of T_1SR and $T_1$44 strains at the minimum OIE recommended dose

For all these reasons, it was decided to perform a number of vaccine efficacy trials in different regions of Africa, with financing from the European Union (EU) and the French Ministry of Foreign Affairs and supervision from the African Union/Interafrican Bureau for Animal Resources. The trials took place in Cameroon, Kenya and Namibia, where pathogenic strains of various genotypes are circulating. It was decided to test the efficacy of T_1SR and $T_1$44 strains at the minimum OIE recommended dose. Naive animals were given a single dose as initial vaccination and were challenged by contact exposure three months later with local and recent pathogenic strains of confirmed virulence. In all cases, the protection afforded by circulating such a vaccination protocol was not satisfactory. Protection varied within the range of 30–60 percent, regardless of the vaccine strain used (Yaya *et al*., 1999). Furthermore, the $T_1$44 vaccine induced some untoward post-vaccinal reactions, especially in Kenya. Subsequently, a second experiment was designed in Kenya in which vaccinated animals were divided into two groups: one group received a booster vaccination one year after the initial immunization, while the other group did not receive the booster. The challenge experiment was organized three months after the booster injection. In these conditions, the booster vaccination induced protection that exceeded 85 percent, irrespective of the strain used – T_1SR or $T_1$44 (Wesonga and Thiacourt, 2000). However, a difference between the two vaccine strains was noted in terms of the longevity of protection. The challenge 15 months after the initial vaccination showed that there was no protection left in the T_1SR-vaccinated group. The initial protection rate was maintained for $T_1$44. These results provided some explanations of what might have occurred in Botswana. It is unlikely that the use of $T_1$44 instead of T_1SR would have modified the outcome to any great extent, and initial vaccinations may have been more efficient if the vaccine dose had been increased. Such a correlation between protection and vaccine dose has been performed only once and will be re-evaluated in 2003–2004 within the CBPP–Pan-African Programme for the Control of Epizootics (PACE) research programme at the National Veterinary Laboratory in Cameroon. Similarly, greater and more persistent protection might have been obtained by giving a booster dose shortly after the initial dose. Such a protocol is quite common for a number of vaccines, and its efficacy for CBPP vaccines will be tested at the Kenya Agricultural Research Institute.

Clearly, the ideal CBPP vaccine has not yet been developed

Clearly, the ideal CBPP vaccine has not yet been developed. The main drawback with T_1SR is that it gives short-term immunity. On the other hand, $T_1$44 occasionally induces local post-vaccinal reactions, and some authors have noted that it could induce lung lesions in exceptional cases (Huebschle *et al*., 2002). However, CBPP vaccines do offer some advantages: they are relatively cheap to produce, and the protection rate afforded by multiple vaccinations is satisfactory. Therefore, CBPP vaccines can still play a major role in control programmes, although their use cannot follow a general guideline that could be applied by every country or region. Each veterinary service should consider the peculiarities and CBPP epidemiology of its own country within the regional context in order to design specific guidelines that will be both less expensive and more efficient to implement.

References

Amanfu, W., Masupu, K.V., Adom, E.K., Raborokgwe, M.V. & Bashiruddin, J.B. 1998. An outbreak of contagious bovine pleuropneumonia in Ngamiland district of north-western Botswana. *Vet. Rec.,* 143: 46–48.

Huebschle, O., Lelli, R., Frey J. & Nicholas, R. 2002. Letter to *Vet. Rec*., 11 May, 615.

Le Grand, D., Solsona, M., Rosengarten, R. & Poumarat, F. 1996. Adaptative surface antigen variation in *Mycoplasma bovis* to the host immune response. *FEMS microbiology letters*; 144: 267–275.

Lefevre, P.C. 2000. Contagious bovine pleuropneumonia. *In* OIE, *Manual of standards for diagnostic tests and vaccines,* pp. 123–133. Paris, OIE.

Lorenzon, S., Arzul, I., Peyraud, A., Hendrikx, P. & Thiaucourt, F. 2003. Molecular epidemiology of CBPP by multilocus sequence analysis of *Mycoplasma mycoides* subsp. mycoides SC strains. *Vet. Microbiol*., accepted.

Lorenzon, S., David, A., Nadew, M., Wesonga, H. & Thiaucourt, F. 2000. Specific PCR identification of the T1 vaccine strains for contagious bovine pleuropneumonia. *Mol. Cell Probes,* 14: 205–210.

Masiga, W.N. & Windsor, R.S. 1974. The efficacy of T_1 strain broth culture vaccine against contagious bovine pleuropneumonia: the effect of revaccination of cattle 6 months and 1 year after primary vaccination and prolonged exposure. *Bull. Epiz. Dis. Afr*., 12: 27–31

Masiga, W.N., Domenech, J. & Windsor, R.S. 1996. Manifestation and epidemiology of contagious bovine pleuropneumonia in Africa. *Rev. Sci. Tech. Off. Int. Epiz*., 15: 1283–1308.

Provost, A., Perreau, P., Breard, A., Le Goff, C., Martel, J.L. & Cottew, G.S. 1987. Contagious bovine pleuropneumonia. *Rev. Sci. Tech. Off. Int. Epiz*., 6: 625–679.

Rosengarten, R. & Yogev, D. 1996. Variant colony surface antigenic phenotypes within mycoplasma strain populations: implication for species identification and strain standardization. *J. Clin. Microbiol*., 34: 149–158.

Sheriff, D. & Piercy, S.E. 1952. Experiments with an avianised strain of the organism of contagious bovine pleuropneumonia. *Vet. Rec.,* 64: 615–621.

Wesonga, H.O. & Thiaucourt, F. 2000. Experimental studies on the efficacy of T_1SR and T1/44 vaccine strains of *Mmm*SC against a field isolate causing contagious bovine pleuropneumonia in Kenya: effect of a revaccination. *Rev. Elev. Med. Vet. Pays Trop.,* 53: 313–318.

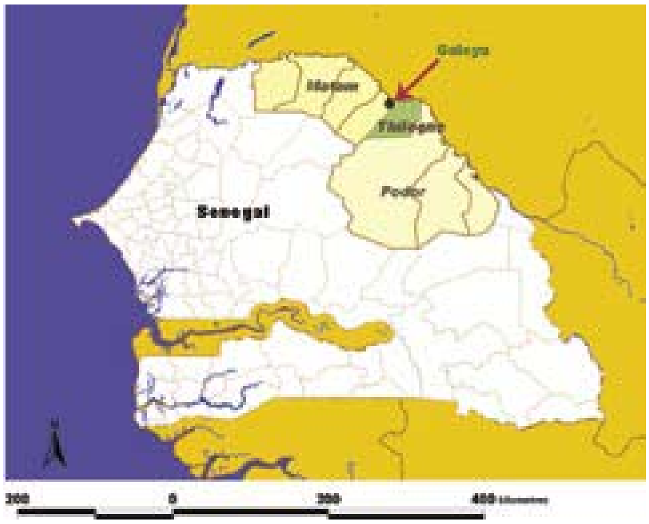
Yaya, A., Golsia, R., Hamadou, B., Amaro, A. & Thiaucourt, F. 1999. Essai comparatif d'efficacité des deux souches vaccinales T_1 44 et T_1 SR contre la péripneumonie contagieuse bovine. *Rev. Elev. Med. Vet. Pays Trop.,* 52: 171–179.

RIFT VALLEY FEVER

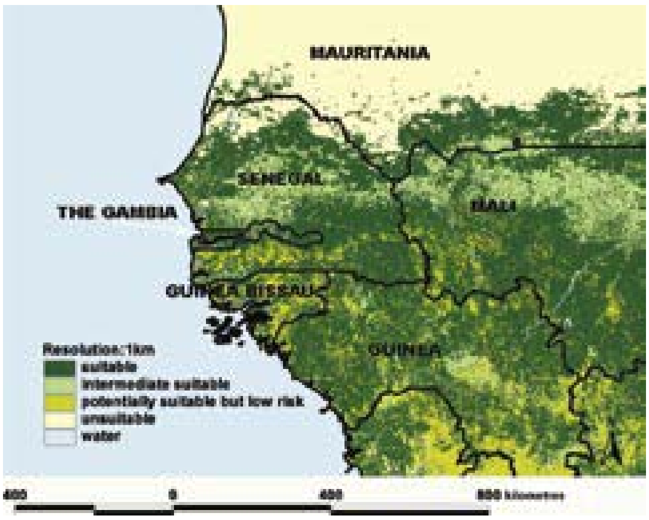
Rift Valley fever monitoring in West Africa in 2002

Active surveillance of RVF was carried out through the monitoring of sentinel herds

Serological and clinical data generated for the third consecutive year by the FAO-supported regional Rift Valley fever (RVF) surveillance system contributed to a better understanding of the epidemiology of the disease at the regional level, as well as countries' enhanced preparation to respond to occurrences of the disease. Active surveillance of RVF was carried out through the monitoring of sentinel herds (sera were collected from 785 small ruminants and tested for the detection of IgM and IgG antibodies) from July to November 2002 in Mauritania and Senegal.



RVF outbreaks in Galoya (Matam) and Thilogne (Podor)



RVF risk map: potential areas of risk in Western Africa

Note: This map was originally generated for the African continent and is the result of the combination of four layers: the digital elevation model, slope gradients, land cover, and forest cover. A suitability indicator was defined according to the biology of the transmission vector (mosquito) of RVF virus. This work should be validated further in 2003–04 using groundtruth data (e.g. results of a serological survey and entomological studies).

In Mauritania, viral circulation was observed in August in the Assaba region, Keikratt (four IgM-positive sheep and goats out of 30), and a human case was detected in November (village of Bachaat, Mbout, Gorgol region). Two clinical suspicions were also investigated, but were found to be negative in sero-neutralization.

In Senegal, there was no evidence of viral circulation in September and October (no antibodies were detected by serological monitoring). However, at the end of the rainy season, frequent abortions were reported in Galoya and Thilogne, and a mission was sent to conduct an epidemiological investigation. In total, the disease was suspected on four occasions, and two outbreaks were confirmed.

Serological results (IgM ELISA) in small ruminants displaying clinical signs compatible with RVF (Senegal River – Podor, Saldé, Galoya and Bile)

No.	Village	Type of sample	Species	Sex	Age	Clinical signs	ELISA IgM*
1	Bile	Serum	Ovine (mbortou ndiamalou)	Female	1 year	Abortion	1.137
2	Bile	Serum	Ovine (hérou ndiamalou)	Female	3 years	Abortion	1.397
3	Bile	Serum	Ovine (powro)	Female	1 year 6 months	Abortion	1.397
4	Bile	Serum	Ovine (ndakou danedji)	Female	2 years 6 months	Abortion	1.366
5	Bile	Serum	Ovine (hirqué danedio)	Female	2 years 6 months	Abortion	1.215
6	Bile	Serum	Ovine (hirquewou mboulou)	Female	2 years	Abortion	1.392
7	Bile	Serum	Ovine (ndakou ndiadou)	Female	2 years	Abortion	1.357
8	Bile	Serum	Ovine (thiadjou balewou)	Female	2 years	Abortion	1.386

* Reference positive sera: 0.757.
Reference negative threshold: 0.05.

The first confirmed outbreak was located at Bile, 6 km southwest of Galoya (Podor), near the Senegal River, where 20 abortions in a herd of 99 animals were observed over a period of ten days. Eight animals were sampled on 11 November and all tested positive for IgG and IgM RVF antibodies.

The second outbreak was confirmed in four herds located 17 km south of Thilogne (Matam region), also near the Senegal River. Several abortions had been observed in these herds. Four serum samples were collected and all tested positive against RVF IgG and IgM antibodies.

The striking event of 2002 was the epizootic of RVF in the Gambia, confirming that the whole subregion should be considered at high risk. Although the disease had never been reported from the Gambia before, serological testing of domestic ungulates after the 1987 outbreak in Mauritania showed the presence of some viral circulation (seropositivity in IgM and IgG antibody) (Ksiazek *et al.*, 1989). So far, determining factors that are conducive to the epizootic in the Gambia have not been elucidated. An in-depth epidemiological analysis associated with a study of climatic and environmental patterns was carried out by national authorities in order to improve understanding of the origin of this event.

PHOTO: PROF. COETZER, UNIVERSITY OF PRETORIA

Ewe aborting as a result of RVF

Serological results (IgM ELISA) in small ruminants with clinical signs compatible with RVF (Matam region)

No	Village	Type of sample	Species	Sex	Age	Clinical signs	ELISA IgM*
1	Balel Pathe	Serum	Ovine (niawou)	Female	1 year	Abortion	1.226
2	Diamel	Serum	Ovine (thiaygou)	Female	1 year	Abortion	1.004
3	Dabia	Serum	Ovine (errou)	Female	1 year	Abortion	1.095
4	Balel Pathe	Serum	Ovine (norou)	Female	1 year	Abortion	1.199

* Reference positive sera: 0.757.
Reference negative threshold: 0.05.

PHOTO: PROF. COETZER, UNIVERSITY OF PRETORIA

Hepatic syndrome: vasculitis and necrosis of the liver

The detection of RVF outbreaks in Senegal and Mauritania in 2002 highlights the importance of maintaining an appropriate level of surveillance activities in high-risk areas, especially in countries where the disease is known to be enzootic. Indeed, during inter-epizootic periods, disease surveillance systems tend to weaken and there is the risk that they are no longer operational when disease begins to reappear. The current RVF surveillance system, which was established three years ago through an FAO Technical Cooperation Programme project that associates active and passive surveillance techniques, was instrumental in the rapid detection of the presence of the disease and the determination of its magnitude. In fact, the active surveillance that was carried out between July and November 2002 showed an absence or a very low level of viral circulation in high-risk areas. However, clinical signs of the disease were observed, particularly late in the season (December), which was quite unusual. These cases remained isolated, and the disease did not reach epidemic proportions.

It must be stressed that this work is the result of active collaboration among the various partners of the network, including the national veterinary services, diagnostic and research laboratories, the Institut Pasteur in Dakar and several international and regional institutions involved in animal and human health surveillance. All the stakeholders will have the opportunity to meet in Dakar in January 2004 during a workshop organized by the PACE programme to consider the best control strategies for the disease.

Reference

Ksiazek, T.G., Jouan, A., Meegan, J.M., Le Guenno, B., Wilson, M.L., Peters, C.J., Digoutte, J.P., Guillaud, M., Merzoug, N.O. & Touray, E.M. 1989. Rift Valley fever among domestic animals in the recent West African outbreak. *Res. Virol.*, 140: 67–77.

RVF surveillance in Iraq (January 2003)

Two field visits were organized in January 2003 in four governorates

Following a first epizootic in the Near East (Saudi Arabia and Yemen, 2001), FAO Technical Cooperation Programme Project TCP/IRQ/166 was initiated in order to enable the Iraqi Veterinary Programme Services to carry out serosurveillance for RVF in southern Iraq.

Two field visits were organized in January 2003 in four governorates (Anbar, Muthanna, Najef and Karbala), and 500 sheep and goats from 28 herds were bled. Serum samples were collected from 457 sheep and 43 goats. Some 472 females and 18 males were sampled and tested for the presence of IgG and IgM RVF antibodies using an enzyme-linked immunosorbent assay (ELISA) technique.

Project activities focused on collecting blood samples from small ruminants, establishing a serum bank, and training scientific staff at the rinderpest and peste des petits ruminants (PPR) laboratory in ELISA techniques for the diagnosis of RVF. During the field visits, two lectures were given to veterinarians from four governorates.

Iraqi national authorities decided to conduct a serological survey (with FAO assistance) in areas considered at risk of RVF virus circulation. The analysis of 500 sera showed two sheep to be seropositive for RVF IgG antibodies, which seems to be the first seropositivity for RVF IgG antibodies detected in animals in Iraq. It is now necessary to verify these results by the virus neutralization test, which is the reference test for the diagnosis of RVF. The positivity of false positive reactions (non-specificity) should be considered.

Owing to damage caused by war in March–June 2003, the laboratories in Iraq are not functional, and no further analysis can be completed until the country begins reconstruction. FAO's Emergency Operations and Rehabilitation Division is involved in an urgent rehabilitation programme in the fields of agriculture and animal health.

PHOTO: DR YAYA THIONGANE

Rinderpest and PPR laboratory in Baghdad, Iraq, early 2003

PHOTO: DR YAYA THIONGANE

Blood collection from small ruminants in southern Iraq, January 2003

WORKSHOPS

FAO and IAEA Joint Workshop on the Diagnosis and Monitoring of Contagious Bovine Pleuropneumonia – TCP/RAF/0172 and RAF/5/053

The main objective of the joint workshop was to expose participants to theoretical and practical aspects of the laboratory diagnosis of CBPP as a support to overall surveillance activities and data collection on the prevalence of the disease

A training workshop on the diagnosis and monitoring of contagious bovine pleuropneumonia (CBPP) was held from 10 to 14 February 2003 at the Central Veterinary Laboratory in Bamako, Mali, in conjunction with the Joint FAO/International Atomic Energy Agency (IAEA) Division, Vienna. This was part of the activities of the FAO project, A Coordinated Programme to Strengthen Capacity for Epidemiosurveillance of CBPP in West Africa (TCP/RAF/0172), and the Joint FAO/IAEA project, Monitoring of Contagious Bovine Pleuropneumonia in Africa Using Enzyme Immunoassays (RAF/5/053).

The main objective of the joint workshop was to expose participants to theoretical and practical aspects of the laboratory diagnosis of CBPP as a support to overall surveillance activities and data collection on the prevalence of the disease. Key topics covered during the workshop were: sample collection, isolation and identification of *Mycoplasma mycoides* subsp. *mycoides* small colony variant (*Mmm*SC), the complement fixation test (CFT), the latex agglutination test (LAT) for antigen and antibody detection, the dot blot test, and the competitive enzyme-linked immunosorbent assay (ELISA) test and its quality control. Participants from the eight countries (Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Mauritania, the Niger and Senegal) involved in regional TCP project TCP/RAF/0172 attended the workshop.

Ten participants from IAEA member countries (Benin, Botswana, the Democratic Republic of the Congo, Kenya, Namibia, Nigeria, the Sudan, Uganda, the United Republic of Tanzania and Zambia) also attended the training workshop. Lectures were presented by Dr François Thiaucourt (CIRAD/EMVT, France) and Dr John Bashiruddin (Institute for Animal Health, Pirbright, the United Kingdom). Technical presentations on "Control of CBPP in Africa – the strategy of FAO" and "An overview of the activities of project TCP/RAF/0172" were given by the FAO/EMPRES Officer, William Amanfu. Dr Roland Geiger of the Joint FAO/IAEA Division made a series of presentations on basic considerations

PHOTO: ROLAND GEIGER

Participants at a laboratory training workshop on CBPP diagnosis in Bamako, Mali, 10–14 February 2003

Participants at CBPP diagnosis workshop in Bamako, Mali, 10–14 February 2003

PHOTO: ROLAND GEIGER

in the interpretation of laboratory tests for CBPP and in the quality control of serological tests with reference to the CFT and competitive ELISA (cELISA). The workshop identified the following factors as inhibiting effective laboratory support to the diagnosis of CBPP: inadequate practices in the isolation of *Mmm*SC owing to the lack of reagents and the lack of sample submissions; and the variability of CFT reagents and cELISA reagents in some laboratories. Advantage was taken of the presence of representatives from Botswana, Zambia and Namibia to discuss prospects for the control of CBPP in Southern African Development Community (SADC) countries such as Namibia, Angola and Zambia, as well as the protection of CBPP-free countries, such as Botswana, from incursions of the disease.

Inaccurate diagnosis of CBPP is still an important constraint in many PACE countries and it has implications for the development of adequate control programmes and strategies.

Final Research Coordination Meeting of the FAO/IAEA Coordinated Research Programme on the Monitoring of Contagious Bovine Pleuropneumonia in Africa using Enzyme Immunoassays

Report by Roland Geiger, Joint FAO/IAEA Division, Vienna

The main objective of this Coordinated Research Programme (CRP) was to develop assays (cELISA and LATs) and to introduce, compare and validate them (cELISA, LAT and CFT) for the diagnosis of CBPP. The final Research Coordination Meeting of this programme was held from 17 to 21 February 2003 at the CVL in Bamako, Mali. The programme, which provided funding and scientific guidance to research contract holders, began in 1998 and involved 11 research contract holders from 11 countries of West, East and Southern Africa, and three research agreement holders. It was funded and implemented by the Joint FAO/IAEA Division. The LAT was developed in cooperation with the Moredun Research Institute of the United Kingdom, and the cELISA in cooperation with the International Cooperation Centre of Agricultural Research for Development, Department of Tropical and Veterinary Medicine (CIRAD/EMVT), France.

A previous meeting, which was convened by PACE and involved African countries faced with endemic CBPP, identified inadequate diagnostic tools and insufficient knowledge of the distribution and prevalence of the disease as the main constraints to the implementation of efficient CBPP control programmes. The principal achievements of the CRP are the identification and validation of such diagnostic tools (cELISA, CFT and LAT) and the development of testing strategies that overcome the constraints. In this respect, the programme was successful and it is anticipated that it will have a major impact on the establishment of national disease surveillance programmes aimed at controlling CBPP.

The cELISA was identified as a suitable and useful test

The cELISA was identified as a suitable and useful test and one that could be submitted to the OIE Standards Commission to be considered as a prescribed test, along with the CFT. During the CRP, the test was introduced in all the participatory countries and is now operational. Full details on the conclusions and recommendations of the meeting can be downloaded from: http://www.iaea.org/programmes/nafa/d3/crp/d32018-conclusions.pdf.

NEWS

Global Framework for the Progressive Control of Foot-and-Mouth Disease and Other Transboundary Animal Diseases

First regional consultation – Ludhiana, Punjab, India, June 2003

This joint FAO/International Office of Epizootics (OIE) initiative aims to prevent and control transboundary animal diseases (TADs) worldwide.

The Global Framework for the Progressive Control of Foot-and-Mouth Disease and Other Transboundary Animal Diseases (GF-TADs) initiative has the following goals:

- safeguard the livestock industries of developed and developing countries from the repeated shocks of infectious disease epidemics;
- improve food security and incomes in developing countries;
- promote safe trade in livestock and animal products at national, regional and international levels.

It is believed that these objectives can only be achieved if the major TADs are controlled at source, which is mainly in developing countries. The GF-TADs programme will develop along four main thrusts:

- a global early-warning, alert and response system for major animal diseases, to be co-managed by FAO, OIE and the World Health Organization (WHO);
- a global thrust for the progressive control of TADs using the foot-and-mouth disease (FMD) model (FMD has been selected as the model because it was identified as an important disease in all regions, it concerns both developed and developing countries, and it offers a unique opportunity for developing good practices in disease management in all regions of the world);
- completion of global rinderpest eradication, building on the success of the ongoing Global Rinderpest Eradication Programme (GREP) by completing the major undertaking of global eradication of an animal disease, as well as providing the opportunity to develop good disease management practices via the lessons learned through the GREP;
- a flexible regional thrust that takes account of the regional priorities in target diseases, epidemiology and strategies for the progressive control of FMD and priority diseases that have been agreed through regional consultations.

Regional consultation on transboundary animal diseases in South Asia, Ludhiana, Punjab, India, June 2003.
Right to left: D.S. Bains (Secretary to the Government of Punjab, India), S. Morzaria (Regional Officer, FAO/ Animal Production and Animal Health Division, Bangkok), V.K. Taneja (Deputy Director-General, Animal Sciences, New Delhi, India), Sh. Jagmohan Singh Kang (Minister of Animal Husbandry, Fisheries and Dairy Development, Punjab, India), Prof. Kirpal Singh Aulakh (Vice-Chancellor, Punjab Agricultural University, India), Juan Lubroth (Senior Officer Infectious Diseases, EMPRES Group, FAO, Rome)

Drs Subhash Morzaria (left) and John Edwards (right) with a superimposed image of South Asia during discussions on GF-TADs

PHOTO: JUAN LUBROTH

The regional consultation in South Asia was hosted and organized by Punjab Agricultural University Professor, Mohinder Oberoi (who had been a visiting scientist with EMPRES in 2002) and Dr Subhash Morzaria, Senior Animal Health and Production Officer, FAO, Bangkok, with the guidance of Dr John Edwards, OIE, Bangkok, Dr Peter Roeder and Dr Juan Lubroth, FAO, Rome. High-ranking officers from the veterinary services of Bangladesh, Bhutan, India, Nepal and Sri Lanka attended, as did researchers from several Indian institutes and private industry (biologics and food processing). The aims of the consultation were to: solve some of the issues surrounding transboundary disease control from a regional perspective; share information about flow patterns, market movements, weaknesses and strengths; and search collectively for opportunities. Although the focus was collective action against FMD, other priority issues were peste des petits ruminants (PPR) and haemorrhagic septicaemia. All countries committed themselves to declaring freedom from rinderpest by 2007 through the OIE pathway, which will be an important step for a large part of Asia. A second regional consultation will be held in Bangkok at the end of July 2003, and it was hoped that a similar commitment would be made there and that FAO/OIE could unveil its plans at the Regional Animal Production and Health Commission for Asia and the Pacific meeting planned for August 2003 in Pakistan.

All countries committed themselves to declaring freedom from rinderpest by 2007 through the OIE pathway, which will be an important step for a large part of Asia

Participants at the GF-TADs first regional consultation in Ludhiana, Punjab, India, June 2003

TAD*info*: New Regional TAD*info* installed in SADC

In early 2003, Dr Rupert Holmes, Animal Health Officer, EMPRES, collaborated closely with the Southern African Development Community (SADC) on work aimed at improving both disease surveillance in the region and the SADC's regional animal health information system.

Development of the livestock sector within SADC is the domain of the Livestock Sector Technical Committee

Development of the livestock sector within SADC is the domain of the Livestock Sector Technical Committee. This committee meets annually in SADC countries on a rotational basis, and consists of the heads of veterinary and livestock development/production services of member countries. It has established expert subcommittees to advise it and to carry out certain tasks in the region. One of these is the Subcommittee on Veterinary Epidemiology and Informatics, currently chaired by Namibia. Among its main terms of reference is the establishment of an animal health information system within the region.

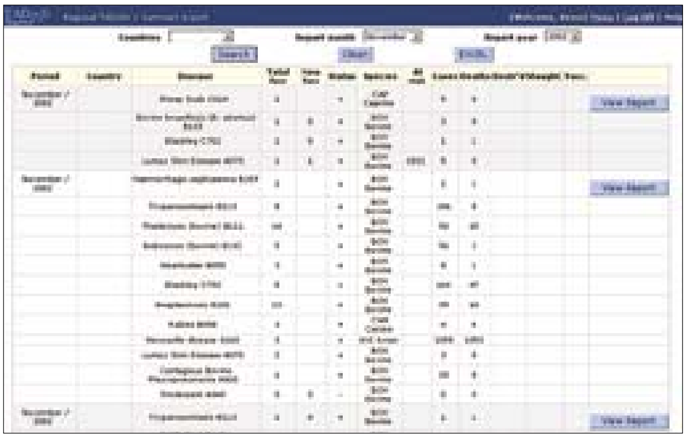
In 1998, the subcommittee took the significant step of setting up a regional early warning system, with a disease database installed in Windhoek and hosted by the Namibian Directorate of Veterinary Services. Member countries have been participating actively in the system and submit regular summary and detailed disease reports to Windhoek. The unit produces monthly and yearly analyses of the data it receives, and these bulletins receive wide distribution.

Following a request from the SADC Secretariat, further strengthening of the network has been conducted through the FAO Technical Cooperation Programme by the deployment of FAO's National Transboundary Animal Disease Information System (TAD*info*) software in 8 of its 14 member countries, by training activities in disease surveillance, and by the development of a regional animal health information database – Regional TAD*info*.

Regional TAD*info* is a Web-based application, which was developed using Java programming language and is capable of operating over the Internet. It incorporates FAO's successful Key Indicators Mapping System (KIMS) software, which facilitates the rapid production of disease distribution maps without the need for any prior skills in geographic information systems (GIS) and gives the user an instant idea of the spatial distribution of disease data contained in the database. The software has very powerful yet flexible analytical capabilities and has been developed as a decision-making tool for regional epidemiologists.

Dr Cleopas Bamhare (left), Coordinator of the Epidemiology and Informatics Subcommittee, and Mr Reuben Ngenda (right), Principal Veterinary Technician

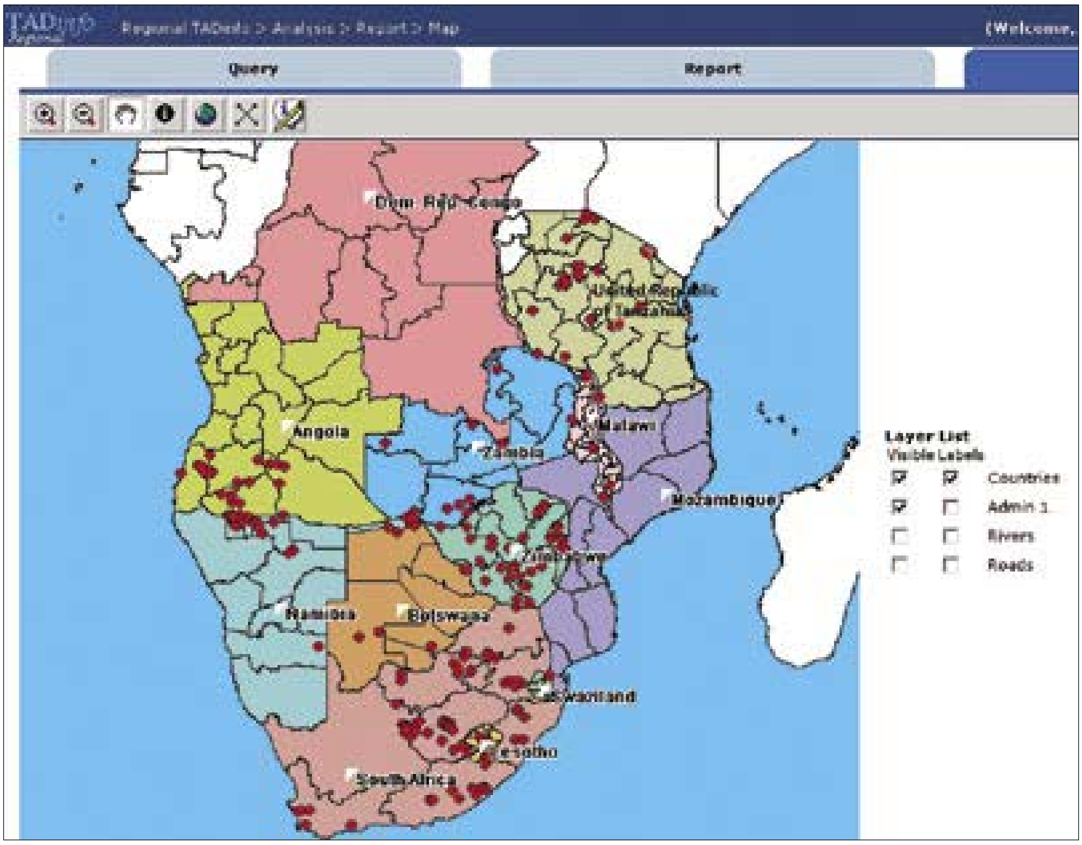
Data entry screen



Results table

In addition to map outputs, the simple graphics interface can readily produce tables and printed forms, and the system can export data in a variety of formats for charting and further statistical analysis. It has been developed using non-commercial products, and is thus a completely stand-alone application. Further work is planned to develop a password-protected Web site allowing users access to data sets and the analytical functions of the software.

Regional TAD*info* has been developed in line with FAO's commitment to producing a hierarchical animal health information system, and it will be capable of integrating data that are automatically generated by National TAD*info*. Its use is seen as a positive step towards the regional improvement of animal disease control in the SADC region.



Map output using the built-in KIMS mapping tool

COMMUNICATION

Clarifying disease spread in the "Eurasian Ruminant Street"

Introduction

The recent incursions of foot-and-mouth disease (FMD) and other epizootics into Western Europe have demonstrated the need for adequate livestock data to support epidemiological analysis and define control strategies. In most European Union (EU) countries, analysis is now enhanced by the availability of georeferenced animal identification and registration data and topographical digital charts, which go down to the level of individual farms. Most road networks are known precisely, as are the main routes of animal transport and the location of processing units. Thus, early warning systems and prediction of the likely pattern of disease spread are gradually becoming a reality across most of Europe.

However, these data and tools are generally not yet available in the adjacent countries of Eastern Europe or in much of the rest of the world. It would appear that access to epidemiological data and investment in transboundary animal disease (TAD) control are broadly correlated to the amount of income generated from local livestock production. Indications are that extensive pastoral and nomadic livestock populations in vast tracts of the Near East and Central Asia are kept in situations where production levels remain low and diseases persist in endemic form. Yet, in these dry lands and other harsh environments, livestock is often the single most important means of securing a livelihood. There is considerable marginalization of rural societies because of a combination of interrelated factors including demographic pressure, environmental negligence, ethnic conflict, civil strife, fragile rural economies and unstable governments in incipient democracies.

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In sharp contrast to this are the extensive production environments of the more localized, highly productive, modern livestock industries that are scattered across the Near East, mostly in the proximity of urban centres. For example, profound changes in pastoral livestock production and traditional nomadism in Saudi Arabia over the past half century have resulted in a decline in range forage (used as a basic ruminant feed resource) to less than 20 percent of its original cover. New systems of mechanized nomadism using vehicles and water tanks have evolved. The availability of cheap barley feed, machinery and labour now dictate production volumes throughout the country. As a result, ruminant meat is increasingly produced in modern feedlots, industrial poultry production has become common and dairy farms operate at one of the highest productivity levels in the world.

Clearly, epidemiological analysis along transects that range from disease free to fully endemic poses a major challenge. It requires a more composite, geographic picture of the whole circuitry of available land and water resources (forage and feed, animal distribution, fattening, transport, marketing, processing, distribution, consumption and waste disposal), presented in an adequate form for clarifying the epidemiology of FMD and other TADs. The following paragraphs give brief descriptions of some of the recent activities in this regard that the FAO Animal Health Service has initiated and coordinated, and suggestions on how to enhance this work.

Many countries do not have adequate systems for collecting, analysing and reporting livestock population or general agricultural statistics

Livestock geography and land use

Many countries do not have adequate systems for collecting, analysing and reporting livestock population or general agricultural statistics. Available information about livestock resources is often incomplete and of doubtful reliability, and so alternative means of assessing land cover and livestock resources in remote and inaccessible regions need to be considered.

Livestock dynamics in the Arabian Peninsula

A recent FAO report (FAO, 2003a) provides a review of national and regional livestock resources and trade in the Arabian Peninsula. The available information on animal protein demand, livestock distribution, trade and movements has been collated with the aim of assisting the epidemiological analysis of TADs in the Arabian Peninsula (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, the United Arab Emirates and Yemen) and neighbouring Iraq, Jordan and the Syrian Arab Republic.

The demand for sheep in the Arabian Peninsula varies during the year, peaking during religious festivals. During the month of Ramadan, the ninth month of the Muslim calendar, adherents fast during the day and eat in the evening or early morning. A three-day holiday period known as *Eid ul Fitr* (Feast of Fast Breaking) celebrates the end of Ramadan. A second festive occasion, *Eid ul Adha* (Feast of Sacrifice), is celebrated on the tenth day of the month of *Zul-Hijja*, a few months after Ramadan, when many Muslin families sacrifice a sheep.

Livestock trade in the region is driven by demand from the Gulf States

Livestock trade in the region is driven by demand from the Gulf States (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates), which collectively accounted for 71 percent of the recorded 11.3 million live sheep, goats and cattle imported in 2000 and 2001. In 2002, Saudi Arabia was by far the world's largest importer of live animals, with 4.2 million sheep and 1.1 million goats.

In recent decades, there have been significant changes in the mode of livestock production, including increased availability and utilization of crop residues, widespread supplementary animal feeds, mechanized pastoralism and the introduction of modern dairy and poultry production units. The seasonal and tribal movement patterns of traditional nomadism and transhumance have been transformed, especially in Iraq, Jordan, Saudi Arabia and the Syrian Arab Republic. With transport to supply animal feeds and tank trailers to provide water, pastoral livestock production is less dependent on rainfall and range conditions than it was. Traditional seasonal patterns of movement to and from specific areas have been replaced by more erratic and opportunistic movements to areas with seasonable crop residues and natural pasture, where water and supplementary feed can be supplied.

Satellite imagery and seasonal animal movement

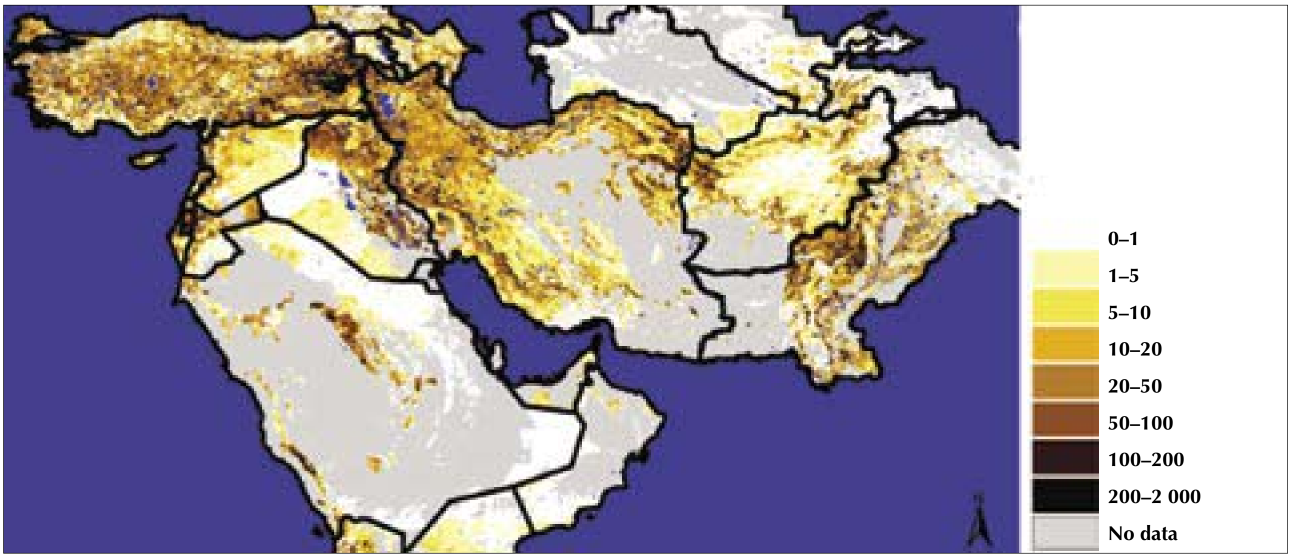
Satellite imagery provides geospatial information on environmental variables, such as those related to climate, ecozones, vegetation patterns and general land cover. Satellite data are integrated with data from geographic information systems (GIS) to produce novel, digital maps that demarcate grazing areas, farming systems and ruminant livestock distributions. Where satellite imagery is available in time series form, it becomes possible to plot the dynamics of the farming landscape.

One of the products resulting from the integration of satellite imagery and GIS data is the display of seasonal availability of grazing

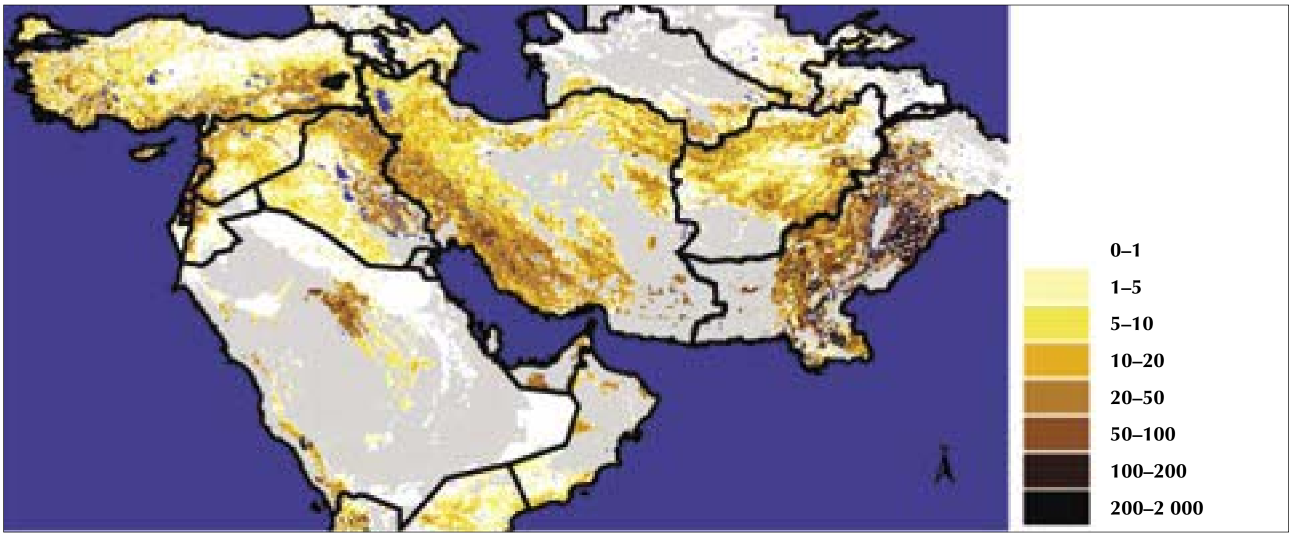
One of the products resulting from the integration of satellite imagery and GIS data is the display of seasonal availability of grazing. This information facilitates the definition of livestock husbandry patterns considerably, and therefore provides insight into the understanding of disease spread.

Geospatial models for disease spread

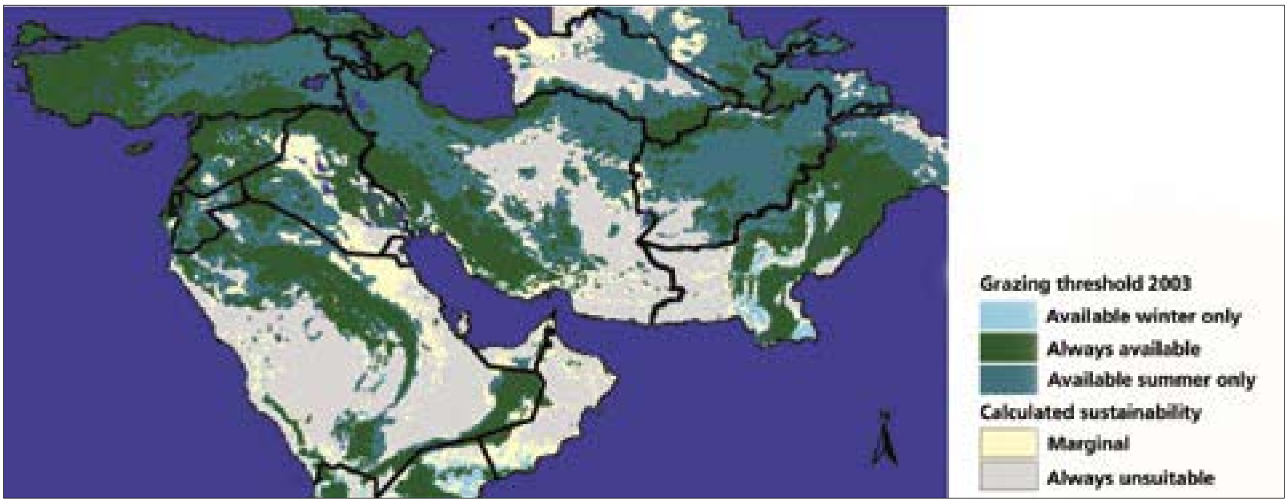
A training module on spatial epidemiology simulates the spread of any contagious ruminant disease under the circumstances prevailing in the Near East and Central Asia. The model is user-friendly, adaptable and generic. Livestock husbandry and other environmental layers generated in a GIS environment are introduced directly into the model in order to improve the prediction of disease spread. The model is generic in that the spread of pathogens is simulated on the basis of the characteristics of the livestock



Annual mean sheep density, per square kilometre
Source: FAO, 2003b



Annual mean goat density, per square kilometre
Source: FAO, 2003b



Seasonal grazing availability in 2003
Source: FAO, 2003b

KEY POINTS

1. A four-month pilot study, involving a number of experts from FAO, Turkey, the Islamic Republic of Iran and European institutions, was conducted to explore the potential for improving understanding of the relationship between the animal production and trade environment and FMD occurrence.
2. The study brought together a great amount of information, and predictive geospatial models to explore FMD risk more effectively were developed.
3. The study highlighted the potential for using remote sensing and GIS-based information systems to integrate the multiple factors that drive animal movement in the region and to present them in a useful form.
4. Such systems might be useful in analysing and predicting the risk of FMD virus movement across the Near East and in identifying critical control points.
5. Understanding and utilizing the knowledge of risk factors for animal movement might also be extremely important for the control of other dynamic TADs in the Near East and Central Asia.
6. In order to collate the missing information, it is first necessary to establish strong regional networks for early warning and early reaction, based on enhanced information and communication functions and tools, including the application of remote sensing, GIS and spatial models, as applicable and desired.
7. As a potential way ahead, the member countries of the FAO/International Fund for Agricultural Development (IFAD) Regional Animal Disease Surveillance and Control Network (RADISCON) project expressed a strong interest in developing a network for the analysis of animal movement risks in the Near East.
8. Animal health management is only one element of animal production as a whole. Unless the income generation prospects of remote pastoral societies are improved, it will be difficult to step up TAD control across the Near East and Central Asia.

production environment. Concerning the disease itself, the model is specific regarding the basic reproductive rate, the transmission rate, host recovery, the immunity level, etc.

One of the main purposes of geospatial models is to accommodate both short-range, stochastic spread and medium- to long-range jumps. In extensive ruminant livestock systems in Central Asia and the Near East, disease pathogens travel in a somewhat continuous fashion from flock to flock and from village to village, whereas jumps can occur when animals are moved on foot or by truck over long distances. The passive movement of animals is in response to the erratic availability of grazing, pasture seasonality or food-chain-related transports, such as for fattening, marketing, slaughter or direct sales in urban centres. The combination of short- and long-range dispersal is known as "stratified dispersal", and dispersal is also characterized by the establishment of new outbreaks ahead of the moving frontline.

The simulation becomes more realistic when masks are incorporated, such as that for the presence of unsuitable areas where no animals can be kept. Any other GIS layers with spatial information about the probability of local disease spikes taking place can be accommodated. In most scenarios, the most important layer forms animal density, which acts as a major risk multiplier. Conversely, the animals behind the travelling frontline die or become immune and make the disease fade out. Satellite-derived local grazing availability can be translated into seasonality multipliers, so that local livestock densities are adjusted continually to the available grazing. This opens the door to the real-time monitoring of animal production and health features.

Conclusions

Critical gaps in epidemiological information can be overcome to include the dynamic TADs of the Near East and Central Asia. In order to collate the missing information, it is first necessary to establish strong regional networks for improved early warning and early reaction. These networks need to be based on enhanced information and communication functions and tools, including the application of remote sensing systems, GIS and spatial models.

Bibliography

FAO. 2001. *Livestock geography: new perspectives on global resources*. CD-ROM. Study carried out by FAO consultants of the Environmental Research Group Oxford Ltd, UK, Avia-GIS, Belgium, and technical staff of the FAO Animal Production and Health Division, Rome. Last update December 2002 (available at http://ergodd.zoo.ox.ac.uk/livatl2/).

FAO. 2002. *Environmental health management. Training module on spatial epidemiology*. Consultant report by M. Gilbert, Free University of Brussels, Belgium, FAO consultant, December 2002. Rome.

FAO. 2002. *Seasonal mapping of climatic and vegetation indices in the Eurasian Ruminant Street*. Report by J. Biesemans, Avia-GIS, Belgium, FAO consultant, December 2002. Rome (available at http://www.avia-gis.com/WWW_en/index_en.html).

FAO. 2003a. *Livestock dynamics in the Arabian Peninsula. A regional review of national livestock resources and international livestock trade*, by D. Bourn. Rome (available at http://ergodd.zoo.ox.ac.uk/download/index.htm).

FAO. 2003b. *Ruminants, seasons and grazing in the Middle East*, by W. Wint. Rome (available at http://ergodd.zoo.ox.ac.uk/download/index.htm).

IN BRIEF...

Rinderpest

In January 2003, delegates to the International Office of Epizootics (OIE) declared Pakistan "provisionally free" from rinderpest. In June 2003, the Islamic Republic of Iran was also declared "provisionally free".

Since the previous *EMPRES Bulletin* (No. 22 – 2002), the OIE has been notified of outbreaks of EMPRES priority diseases in different regions around the world (January to June 2003):

Disease	Country	Date	Location	Agent characterization
Contagious bovine pleuropneumonia	Eritrea	April 2003	Asmara	
Classical swine fever	Bulgaria	February 2003	Silven and Kermen (Silven Region) and Yasna Polyana village (Burgas Region)	
	Germany	March 2003	Bad Dürkheim district, Rhineland-Palatinate Land	
	Republic of Korea	March 2003	Iksan City, Chonbuk Province, in the south of the country	
African swine fever	Congo	June 2003	Harbour city of Matadi, Lower Congo Province	
Rift Valley fever	Gambia*	February 2003	8 locations in the valley of the River Gambia	
Foot-and-mouth disease	Botswana	February 2003	Strauss Farm, Tsiteng, Matopi, A Black Bearded Farm	FMD SAT 1
	Hong Kong SAR	February 2003	Yuen Long and Kam Tin (District 8)	Not typed
	Malawi	June 2003	Blantyre and Shire Valley	FMD SAT 2
	Libyan Arab Jamahiriya	June 2003	In the northwest of the country: provinces of Sabratah and Az Zawiyah	FMD SAT 2
	United Arab Emirates	May 2003	Dubai	Virus serotype O
Highly pathogenic avian influenza	Netherlands	From March 2003	provinces of Gelderland, Utrecht (March 2003), Noord-Brabant, Limburg (April 2003)	Highly pathogenic avian influenza virus subtype H7
	Belgium	From April 2003	Limburg Province, Antwerp Province	Highly pathogenic A/ chicken/Belgium/6175/ 03 (H7N7) virus
	Germany	May 2003	Schwalmtal municipality, Viersen District, North Rhine-Westphalia Land	Avian influenza virus subtype H7
	Hong Kong SAR	January 2003	Penfold Park, Shatin, Kowloon Park, Kowloon, Lok Ma Chau, New Territories	Highly pathogenic avian influenza virus H5N1
Peste des petits ruminants	Mali	January 2003	Dogoni community, Sikasso District, Sikasso Region, Ségou community, Ségou District, Ségou Region	
Bluetongue	Serbia and Montenegro	January 2003	Ub, Šabac, Kosjeric, Kraljevo, Priboj	
	Tunisia	January 2003	Kairwan Governorate, Monastir Governorate	
	Singapore	February 2003	Mandai	

* Information from FAO because the Gambia is not an OIE member country.

CONTRIBUTIONS FROM FAO REFERENCE LABORATORIES AND COLLABORATING CENTRES

FAO/OIE World Reference Laboratory for FMD, Pirbright, UK

Report for December 2002

Country	No. of samples	FMD virus serotypes							SVD virus[1] (a)	NVD[2] (b)
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1		
Ghana	9	-	-	-	-	-	-	-	-	9
Paraguay	2	2	-	-	-	-	-	-	-	-
TOTAL	11	2	0	0	0	0	0	0	0	9

[1] Swine vesicular disease virus.
[2] No foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected.

Report for January to March 2003

Country	No. of samples	FMD virus serotypes							SVD virus[1] (a)	NVD[2] (b)
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1		
Botswana	20	-	-	-	-	-	-	-	-	20
Iran	16	6	7	-	-	-	-	-	-	3
Israel (Pal. Aut. Ter.*)	1	1	-	-	-	-	-	-	-	-
Italy	38	-	-	-	-	-	-	-	38	-
Lebanon	4	4	-	-	-	-	-	-	-	-
Pakistan	44[3]	18	10	-	-	-	-	7	-	10
Turkey	10	4	3	-	-	-	-	-	-	3
Viet Nam	8	8	-	-	-	-	-	-	-	-
TOTAL	141[3]	41	20	-	-	-	-	7	38	36

[1] Swine vesicular disease virus.
[2] No foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected.
[3] One sample from Pakistan contained a mixture of foot-and-mouth disease virus types O and A.
* Pal. Aut. Ter.: Palestinian Autonomous Territories.

Report for April to May 2003

Country	No. of samples	FMD virus serotypes							SVD virus[1] (a)	NVD[2] (b)
		O	A	C	SAT 1	SAT 2	SAT 3	Asia 1		
Afghanistan	57	8	-	-	-	-	-	-	-	49
Bhutan	21	2	1	-	-	-	-	-	-	18
Iran	13	6	2	-	-	-	-	-	-	5
Philippines	23	9	-	-	-	-	-	-	-	14
United Arab Emirates	3	3	-	-	-	-	-	-	-	-
TOTAL	117	28	3	-	-	-	-	-	-	86

[1] Swine vesicular disease virus.
[2] No foot-and-mouth disease, swine vesicular disease or vesicular stomatitis virus detected.

FAO/OIE World Reference Laboratory for RP and PPR, Pirbright, UK

Report for January to June 2003

Date	Country	Species	Test	Result
17/12/2002	Nepal	Bovine/ovine/caprine/ buffalo	PPR/RP C-ELISA and VNT	Confirmatory
24/03/2003	Somalia	Bovine	RPV RT-PCR	Negative
08/05/2003	Afghanistan	Bovine/ovine/caprine	RPV RT-PCR	Negative
02/06/2003	Latvia	Bovine/ovine	PPR/RPV C-ELISA	Negative

NEWS@RADISCON

Radiscon Regional Animal Disease Surveillance and Control Network

Inter-Country Collaboration and Coordination Workshop for Transboundary Animal Disease and Tick-borne Disease Control

Damascus, Syrian Arab Republic, 9–11 March 2003

The final workshop and Chief Veterinary Officers (CVOs) meeting under the RADISCON (Phase One) fund was held in Damascus, the Syrian Arab Republic. The workshop had been organized to review animal health status, disease surveillance and control policy, as well as the future perspective of the RADISCON project.

The RADISCON countries invited to the workshop were the Gulf Cooperating Council (GCC) states, the Islamic Republic of Iran, Pakistan, Turkey and Yemen. Presentations included: the status of RADISCON over its five-year existence; the importance and socio-economic effect of TADs in a regional context; the status of GREP; links between the Animal Health Commission for the Near East and North Africa (AHCNENA) and RADISCON; information systems (and the new Java-based TAD*info*); contingency planning; the FAO/OIE initiative on the Global Framework for the Progressive Control of FMD and other TADs; risk assessment and modelling in animal health; control of tick-borne diseases; veterinary vaccinology; and performance indicators of veterinary services. The opening ceremony was inaugurated by Dr Nor Al Den Mauna, Minister of Agriculture and Rural Reform, the Syrian Arab Republic, in the company of Dr Mahmoud Taher, FAO Regional Office, the Syrian Arab Republic. It was attended by some 100 people, including members of the press.

Representatives of the attending countries (Bahrain, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia, the Syrian Arab Republic, Turkey, the United Arab Emirates and Yemen) presented the status of TADs and their control and shared inputs concerning TADs prevention in the then growing crisis in Iraq. Of note was the need for countries in the region to embark on the OIE pathway for accreditation of rinderpest freedom and to follow through with submission for recognition of freedom from disease and infection.

During the three-day workshop, the participants presented their country reports on the current status of the animal health situation and its constraints; the workshop also focused on TADs and tick-borne diseases. Ticks and tick-borne diseases, as well as RVF, are a great concern in public health, animal health and trade in animal and animal products.

Recommendations from the participants for a possible Phase Two RADISCON are summarized below.

Recommendations for implementation of RADISCON Phase Two (21 countries)

As RADISCON Phase One ended in March 2003, the interested beneficiary countries of RADISCON expressed their strong support for a second phase to:

- achieve harmonized disease data collection, processing and GIS-based analysis, and improve capacities and capabilities for disease surveillance;
- consolidate networking in and among the countries;
- introduce the concept of risk-based surveillance and early warning, and a code of conduct for managing disease emergencies;
- provide decision-support systems for coordinated disease control, provide a forum for decision-makers, and enhance transparency and mutual confidence in disease information exchange;

- build capacity and use of the FAO Technical Cooperation among Developing Countries mechanism, including mutual support.

Also included were the following specific inputs:

1. According to priorities that will be defined by each of the four clusters, RADISCON should emphasize and support the surveillance programmes in member countries, in particular concerning:
   – disease investigations;
   – serosurveillance.
2. Building personal capacities in order to perform surveillance programmes, in particular concerning:
   – analysis of data/information;
   – sampling techniques;
   – risk analysis;
   – developing FAO Technical Cooperation among Developing Countries with "deep" expertise.
3. Identifying laboratories and improving their capacities at the regional level for TADs. It is recommended that the following national and central veterinary diagnostic laboratories provide regional/subregional assistance to RADISCON member countries:
   – Turkey and the Islamic Republic of Iran as foot-and-mouth diagnosing centres;
   – Turkey as a rinderpest and peste de petits ruminants diagnosing centre;
   – the Syrian Arab Republic and the Islamic Republic of Iran as bacteriology (Brucellosis) diagnosing centres;
   – Yemen and Egypt as Rift Valley fever diagnosing centres.
4. Supporting the existing national network, in particular in terms of:
   – database sharing;
   – improved compliance (within the clusters and the OIE), harmonization and sharing of animal health reports;
   – upgrading existing equipment, software (computers, electronic links, global positioning system [GPS] units, TAD*info* and other packages).
5. Strategic control at a cluster level, in particular for:
   – adoption of vaccination programmes for TADs at the regional level;
   – strategic use of vaccines;
   – border harmonization of control measures.
6. Countries that continue to vaccinate against rinderpest should cease this activity as rinderpest has not been reported in the area since 1996. Countries should follow the recommendations of the GREP Secretariat (FAO Animal Health Service) and embark on the OIE pathway of freedom from rinderpest.
7. The RADISCON National Liaison Officer should be a high-level professional within the Veterinary Service's Epidemiologic Unit.
8. Coordination of activities, as presented in the GF-TADs, is endorsed.

The FAO Animal Health Service is grateful to the Syrian Arab Republic's Ministry of Agriculture, Animal Health Department, and the FAO Representative in the Syrian Arab Republic for their kind support, and extends special thanks to all participants, international experts and consultants for their valuable presentations and contributions.

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