SARS epidemic unmasks age-old quarantine conundrum

In Thailand, hotels are requiring visitors from certain countries to check in at separate counters. In India, airline pilots are refusing to fly to some parts of the world. In Singapore, thousands of people must stay home and appear in front of government-installed cameras at random times, and the Roman Catholic Church there has banned confessions until further notice.

This is just a small sampling of responses to the threat of severe acute respiratory syndrome (SARS). As of 14 April, the disease, which originated in the Guangdong province of China, had claimed the lives of 122 people in seven nations and infected more than 3,000 others. The leading hypothesis is that the flu-like illness is caused by a new strain of coronavirus.

Since the World Health Organization sounded the alarm about SARS in March, universities, international companies and governments are recalling people from Hong Kong, major airlines have canceled flights to the region and the WHO has released an unprecedented travel advisory.

Governments across the world have also been struggling to find ways to defend against the disease and many have invoked long-dormant quarantine laws. Several nations, including Vietnam, Malaysia, Taiwan, New Zealand and Australia, are either barring visitors from SARS-affected nations or are requiring them to wear masks for 10 days under threat of hefty fines. In Hong Kong and Singapore, the governments have placed thousands of people under forced quarantine.

“Is it totally predictable — those are the kinds of things that are going to occur,” says Joseph Barbera, co-director for the Institute for Crisis, Disaster and Risk Management at George Washington University. But such measures, Barbera says, are bound to fail. “When you look carefully at quarantine history, it was always a failure,” Barbera says. “The objective is to contain disease, not to contain human beings.”

At best, quarantine can delay the spread of a disease and buy time, says Barbera. Even then, he adds, governments must be rational and provide workers’ compensation or workers’ insurance to those in quarantine and, most important, educate the public on how best to protect themselves.

For many nations, this is the first quarantine experience in decades. In the US, for example, the last mass quarantine was during the 1918–19 Spanish flu epidemic, when the government closed down schools, shops and church services, interrupted train and ship routes and began placing people in quarantine camps. The global response to SARS, 85 years later, has not been much different. “We will do, in this country, whatever is necessary to contain the spread of the epidemic,” said Anthony Fauci, head of the US National Institute of AIDS and Infectious Diseases.

“If that’s quarantine, so be it.”

Isolation of infected individuals is standard procedure in treating infectious diseases such as tuberculosis. Quarantine, on the other hand, applies to people who have been exposed to the disease but may not yet be ill. Separating exposed people and restricting their movements is intended to stop the spread of that illness — but it doesn’t, says Lisa Sattenspiel, associate professor of anthropology at the University of Missouri.

“Isolation at least does something,” she says. “Quarantine is much, much less effective.”

Although experts have maintained for hundreds of years that quarantine doesn’t work, governments intuitively turn to it because it keeps people from moving around, Sattenspiel says. But what they don’t realize, she adds, is the level of compliance required for it to succeed.

Sattenspiel has constructed mathematical models of quarantine based on simulations of the 1918 flu epidemic. “If you’re really able to limit everybody and keep all those people from moving, it does work,” she says. “It’s just that you never have a perfect quarantine because you’re trying to convince perfectly healthy people to stay put. There’s always going to be people who find a way around it.”

In Hong Kong, for example, authorities first used barricades and tape to seal people inside Amoy Gardens apartment building, which produced several hundred of the city’s SARS cases, then placed them in quarantine camps. But when police arrived at the building, residents of more than half the apartments were missing and still remained at large.

The Singapore government enforced large-scale quarantines soon after the disease first struck and hired a security company to place electronic cameras at the homes of those under quarantine. It also began issuing electronic wrist tags to monitor the movements of quarantine violators. In spite of those measures, Singapore’s numbers rose on 14 April to 147 cases, the third highest in Asia.

That may partly be because of the high ratio of ‘superspreaders’ or hypertransmitters of SARS, some experts say. But others warn that the harsh environment may drive people to seek alternative medicines and steer clear of hospitals for fear of being taken from their families. Still, “if you have 20 exposed people and only 10 in quarantine, that’s better than none in quarantine,” says Fauci. “That’s what’s called a common-sense mathematical model.”

Apoorva Mandavilli, New York
Mosquito mating game could mean buzzkill for Brits

Last year, West Nile virus (WNV) claimed the lives of 277 Americans. But while sporadic outbreaks have occurred in southern Europe, no one has yet fallen sick in the UK. One group of British scientists says the key lies in two indigenous mosquito variants and is investigating whether a hybrid of the two could trigger a US-style epidemic.

Although more than 20 species of mosquitoes in the US are infected with WNV, Culex pipiens has historically been the primary culprit. C. pipiens has two known physiological variants—C. pipiens molestus, which bites only people, and C. pipiens pipiens, which bites only birds. For the virus to be transmitted from bird to human—the usual path of infection—the vector must bite both.

Dina Fonseca, an entomologist at the Philadelphia Academy of Sciences, uses rapidly mutating genetic markers called microsatellites to try to differentiate the two C. pipiens variants. C. pipiens molestus is a recently domesticated version of C. pipiens pipiens, Fonseca says. “One possi- bility is that while in the old world you have this domesticated type and this feral type, both of them got introduced into the US and mated, and you got a hybrid that may behave differently.”

Most researchers outside Britain have had no difficulty in mating the two vari- ants in the lab. But in Britain, the two remain isolated in the wild, says Colin Malcolm, a researcher at the University of London. He plans to collaborate with Fonseca to compare British and American C. pipiens using microsatellites.

Malcolm has been investigating reports of a five-year-long biting nuisance in a village in Clackmannanshire, Scotland. His team found the culprit to be a population of C. pipiens molestus breeding in a semi-underground factory. When Malcolm tested the genotype of the mosquitoes, he found, to his surprise, that about half the population tested positive for an insecticide-resistant haplotype or gene set, A2B2, that originated in Africa. Because none of the C. pipiens pipiens they tested within a five-kilometer radius of the factory carried the same haplotype, they concluded that the two variants were not interbreeding.

“We are probably benefiting from the fact that in Britain—so far at least—our C. pipiens pipiens is very bird-specific,” says Malcolm.

In the insecticide-resistant Scottish population—the first of its kind to be de-scribed in Britain—entomologists are dealing with an unknown quantity, says Malcolm. “[The A2B2 haplotype] arrived in Marseilles and we watched it travel north,” he says. “That means that we are dealing with a [C. pipiens molestus] that isn’t necessarily conforming to character-istics that we might have in Britain.”

The continued absence of WNV-related encephalitis or meningitis in Britain is reassuring, Malcolm says. That could be down to the genetic isolation of C. pipiens pipiens, or it could be because the birds they are feeding on are not infected. Last October, rumors appeared in the British press that scientists had found antibodies against WNV in dead birds, but the claims have yet to be supported by a paper published in a peer-reviewed journal.

“In a country like this there is relatively little exposure to humans by mosquitoes,” says Ernie Gould of the Oxford Centre for Ecology and Hydrology. Gould is one of many researchers monitoring birds for new viruses. “The virus may be circulating in the wild and may be virulent,” Gould says, “but it still need not be causing disease.”

Most people in Britain have C. pipiens pipiens breeding in their back garden, Malcolm points out. If the virus is in birds, and a hybrid pipiens-molestus subspecies emerges that bites both man and bird, Britain will be as vulnerable as the US.

Laura Spinney, London

French follow US lead... in cancer research, at least

The French government in March launched a new national plan to boost clinical, basic and epidemiologic cancer research. French President Jacques Chirac announced the unprecedented measure even as the government cut the country’s science budget for the second time in six months.

The five-year national plan against cancer will set aside €11.5 million to coordinate research through the National Institute of Cancer (NIC), a new agency to be supervised by French health and science ministers. The government has said it will increase tobacco taxes to help finance the plan.

The NIC—to be launched next year—will be similar to the US National Cancer Institute and will be built near Paris, says David Khayat, head of medical oncology at the Paris-based Salpêtrière hospital. The plan is a “great opportunity for France,” says Khayat, adding that it will reorganize basic research in oncology. It is also expected to create 2,000 new research positions.

Central to the new scheme are the so-called ‘cancéropôles’, a network of research units that focus on a few cancer-related topics. The units will have links to cancer healthcare centers to gain access to cancer patients. Although cancéropôles will belong administratively to their home institution, they will have a special status and answer only to the NIC. The NIC will coordinate research in cancéropôles and boost collaborations with industry, particularly for clinical trials of new drugs.

The government also plans to create 80 tumor banks with at least 100,000 cancer samples for genetic tumor profiles. Researchers expect to begin assessing data in 2006. In addition to epidemiologic research, such as analysis of risk factors at several levels (environmental, nutritional, occupational and infectious), at least 10% of patients will benefit from clinical trials. The NIC will ensure a tight control of post-authorization studies of newly approved cancer drugs and enhance academic and hospital training in oncology. For example, the new plan aims to double the number of residents in medical oncology and radiotherapy by 2007.

Xavier Bosch, Barcelona
Hollywood horrors bring bioterror to life

It glistens. It swells. It oozes pus. It is crafted with Hollywood special FX. But this horror—a fake buboe mimicking those caused by plague—is arriving at an ER near you.

The plastic carbuncle is one of many blemishes created by a team of medical trainers at the University of Louisville, Kentucky. Using actors, make-up artists and mannequins, the team is recreating the dramatic symptoms of biological and chemical attacks to train naïve health workers.

Doctors’ inexperience in recognizing and responding to biological weapons was first exposed during the US anthrax attacks in 2001, when local medics missed some cases. “Most physicians have never seen these symptoms,” says Rick Clover, who heads the University of Louisville’s School of Public Health.

Rather than learn about the conditions from dull books, the school’s team is using local actors to bring them to life. Part of the so-called ‘standardized patient program,’ the project was fuelled by a $1.5 million grant from the US Centers for Disease Control and Prevention in summer 2002.

Make-up artist Michelle Thompson mastered a repertoire of rashes and blisters by studying fake war wounds at a military camp. Using plastic theater gel painted with red dye, she now expertly sculpts the quarter-sized sores that sprout during cutaneous anthrax. For true authenticity, she crowns them with a black, scabby centre of fake blood; the plague buboe’s pus, on the other hand, is injected vanilla pudding.

A full smallpox infection presents an even greater challenge—building individual pustules on head, neck and arms can take several hours. As a final flourish, spots are spritzed with shimmering glycerin to make them look pus-filled and fresh. “I can’t look at the simulation and not get a chill up my spine,” says program director Gina Wesley.

Nearly 2,000 students, doctors and healthcare workers have encountered the faux bioterror sores thus far. After some training courses, the team even planted an actor in the audience—or hospital emergency rooms—to test personnel on the correct response. Other patients were warned beforehand to avert an all-out panic.

“These kinds of programs are effective,” says Jim James, who heads the American Medical Association’s Center for Disaster Preparedness and Emergency Response in Chicago. Many other bioterror training initiatives, including websites and prompt cards, have recently sprung up, says James, who hopes these efforts can ultimately be standardized.

In Louisville, students also benefit from four state-of-the-art training mannequins. Like scenes from an adrenaline-pumped hospital drama, the ‘sims’ blink, breathe and respond to drugs like real patients laid out by an attack.

In the latest scenario, the team imitated the spreading paralysis induced by botulinum toxin. An actor with frozen face and slurred words alerted students to the early symptoms; students then faced a mannequin whose oxygen level plummeted as it dripped from the diaphragm seized up. Thankfully, 18 of 19 students rescued her by inserting a tube into the trachea, says Wesley.

The Louisville team is already rolling out the program to public-health training facilities across the country. Now that the trainers are adept with many ‘category A’ select agents—anthrax, smallpox, plague and botulinum toxin—they are starting simulations of the select-agent B-list: brucellosis, tularemia and nerve agent sarin.

The trainers are particularly excited about their latest acquisition: a contact lens that mimics the burst blood vessels characteristic of killer virus Ebola. The lens—made by a Hollywood horror specialist—shades the iris red; fake blood is dribbled in the tear ducts. “[The lens is] really beautiful in a gory sort of way,” says Wesley.

Carina Dennis, Sydney

New wave of AIDS rocks Pacific Islands

The Pacific Islands have been relatively unscathed by HIV/AIDS, but infection rates have risen steeply in recent years, tripling in some countries. Efforts to control the spread could be stymied by problems in supplying and distributing condoms to the region. “Many Pacific Islands are undergoing an exponential increase,” says Jimmie Rodgers, senior deputy director-general of the Secretariat of the Pacific Community, a regional development organization.

There are increasing concerns that demand for condoms in the islands may outstrip supply. Last year, the US withheld $34 million from the United Nations Population Fund (UNFPA), the largest supplier of contraceptives to the Pacific region, based on allegations that the agency supported abortions in China—claims the UNFPA insists are false.

“The United States is the only country ever to deny funding to UNFPA for non-budgetary reasons,” says Urmila Singh, UNFPA’s representative in the Pacific. “UNFPA has never, and will never, be involved in coercion in China or any part of the world.”

Despite the deficit, Singh says, the UNFPA has not compromised on contraceptive supply to the countries, but has had to reduce funding to other reproductive health initiatives. Additional pledges from other donor countries have not made up for the loss of US funds.

The new $10 billion US AIDS fund, which is primarily earmarked for Africa and the Caribbean, is unlikely to offer much relief. Some funds may trickle through from the Global Fund to Fight AIDS, Tuberculosis and Malaria, which allocates $100,000 per year for condoms, Singh says.

Geography and climate exacerbate the situation. The islands are scattered over a large portion of the globe, but only a small percent of that area is land. Weak communication links and transportation difficulties hamper distribution, and inadequate storage facilities threaten the shelf life of supplies. This has prompted proposals for a central warehousing facility and bulk purchasing of contraceptive and medical supplies for many of the island nations.

Carina Dennis, Sydney

Helen Pearson, New York
**Ozone exposure throws monkey wrench into infant lungs**

The lungs of asthmatic infants undergo irreversible structural changes when they breathe in polluted air—those results, released in March in Denver, had clean air advocates clamoring for better standards. The fact that the infants are rhesus macaques makes the results no less alarming. The monkeys are the closest models for human lungs, and researchers say they have every reason to believe the same pollution-driven alterations occur in children.

“Many people are now exposed to ozone at ground level above the US standard, and admissions to hospitals for asthma attacks are increasing,” says David Bates, co-editor of the Health and Clean Air newsletter and former dean of medicine at the University of British Columbia. “The two things are almost certainly linked.”

Ozone exposure disrupts nerve and airway branch formation in lungs and forces a dramatic reorganization of airway muscles, according to data from Charles Plopper, developmental biologist at the University of California in Davis. His results stunned many prominent asthma researchers at the annual meeting of the American Academy of Allergy, Asthma and Immunology.

“It’s been very exciting from a scientific point of view, but from a public health standpoint it’s a pretty disquieting situation,” Plopper says. The loss of three to five generations of airway branches is particularly striking because scientists had believed until now that the branch number is fixed in utero.

Many factors resulting from ozone exposure conspire to make animals hypersensitive to allergens and to have a more severe asthma attack, Plopper says. What’s more, the developmental changes may negatively affect lung function throughout the animal’s life, regardless of future air quality. The most worrisome finding, he adds, is that a recovery period of six months did not improve or reverse the developmental changes.

“We live in a valley that contains 7 of the top 20 polluted areas in the US, and our kids are exposed on a daily basis,” says Plorper. “The fact that it didn’t correct itself with another six months was really a shocker.”

Plopper created the primate asthma model to study how asthma develops, and ultimately test new treatments for the condition (Am. J. Pathol. 158, 333–341, 2001). More recently, he investigated what happens in infant monkeys while lung tissue develops postnatally for two years; in children, the same development takes eight to ten years.

The team exposed one-month-old macaques to ozone that mimicked Mexico City levels and a Los Angeles pattern: 0.5 parts-per-million ozone, eight hours a day for five days, followed by nine days of clean, filtered air. A primary component in smog, ozone is known to trigger and aggravate allergic responses that can bring on asthma attacks. The researchers repeated this cycle for five months and then allowed the monkeys to recover with six months of clean air.

The monkeys showed typical immune system and cellular responses seen with asthma. Autopsies revealed a disrupted and rearranged respiratory system. Smooth muscle, which controls airway constriction and relaxation, increased in mass and was realigned to be mostly perpendicular to the airway. Airways were thinner and shorter than in control monkeys.

There is some evidence that Plopper’s observations in monkeys may extend to children. X-rays of otherwise healthy children living in Mexico City show inflamed and over-inflated lungs, says Lilian Calderon-Garcidueñas, an environmental toxicologist at University of North Carolina, Chapel Hill. “The changes in these guys are amazing,” she says of the monkeys. “We probably have something like that happening also in children exposed to ozone.”

Kendall Powell, Denver

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**Slashed state budgets strangle ailing US research**

While US scientists bemoan proposed cuts in federal research funding, more bad news is on the way. State legislators are now considering budgets that would gut many science programs by the end of the year. The cuts, which will affect some of the nation’s most research-intensive regions, compound belt-tightening at top biomedical research philanthropies.

Individual states are faltering under the combined loss of state tax revenues and valuable federal money. In order to pay for basic services, states like New Jersey—which faces a $5 billion deficit—are cutting what they see as nonessential programs. “We’re at a point that’s lower than we’ve ever been before,” says John Tesoriero, executive director of the New Jersey Commission on Science and Technology.

In February, Tesoriero says, New Jersey governor James McGreevey proposed eliminating funding for all state grant programs, including arts, science and technology grants. Tesoriero’s commission, which supports academic and early-stage corporate research in the state, has already had its budget reduced from $25 million to $14.5 million in the past year. Under the new plan, that budget would be eliminated, and researchers who now receive five-year grants would find their funding abruptly cut off.

New Jersey is not the only state facing such drastic cuts. California is considering eliminating state-funded technology programs and Michigan is slashing its Life Sciences Corridor project by more than half; several other states are contemplating similar cuts.

Philanthropies are not likely to pick up the slack, either. After watching its endowment shrink from a high of $13 billion in 2000 to its current $10 billion, for example, the Howard Hughes Medical Institute has begun reviewing all of its programs and trimming many of them. In March, the Institute announced that it would phase out its prestigious pre-doctoral training grants, saving an estimated $17 million annually.

Alan Dove, Philadelphia
UK launches tumor bank to match maligned Biobank

British cancer researchers welcome plans to pool the UK’s small cancer databases into a virtual tumor bank, even as the Medical Research Council (MRC), which will fund part of the project, is smarting from criticism about the UK Biobank database.

The tumor bank, launched by the National Cancer Research Institute, will receive £1 million for each of five years from three primary sources: the Department of Health, the charity Cancer Research UK and the MRC. The tumor bank will complement UK Biobank, a genetic database to help study gene-environment interaction in common diseases.

George Radda, chief executive of the MRC, says both databases will be valuable. “The new approach, using computational biology to handle vast amounts of data...is terribly important,” he says. “It is really going to be the way of solving some of the major health problems.”

A report from the House of Commons’ Science and Technology Select Committee, published 25 March, slammed the MRC’s allocation of funds and raised ethical concerns about Biobank, such as police access to the database. Critics of the project have recommended that legal safeguards be put in place to protect volunteers before recruitment begins, and that volunteers be made aware of the risks. They also recommend that the government invest in research into encryption techniques to ensure the data is secure.

Among cancer researchers contacted by *Nature Medicine*, news of the planned National Cancer Tissue Resource—as the tumor bank will be called—has received an enthusiastic response, however. “I think this is an excellent idea and well overdue,” says John Timms, leader of the cancer proteomics group at the Ludwig Institute for Cancer Research, University College London.

In relatively rare cancers such as ovarian cancer, researchers have not been able to characterize molecular markers that would predict a patient’s response to drugs. “The problem has been access to tissue coupled with very good clinical information,” says James Brenton of the Hutchinson/MRC Research Centre in Cambridge.

The tumor bank will take advantage of National Health Service resources to standardize sample collection and ensure tissue data are stored with the relevant pathological and clinical data. Tissue collection centers will be linked with processing centers, where researchers will perform a battery of analyses involving DNA, RNA and possibly proteomics. Investigators will use tissue microarrays to store and analyze large quantities of data provided by hundreds of patients in clinical trials, and store the data anonymously in a central information system.

Meanwhile, an MRC subcommittee on 4 April released a consultation document on the council’s future investment strategy, in which it recommended that the National Institute for Medical Research at Mill Hill, the oldest and largest of the MRC institutes, be scaled down and moved to another MRC site—possibly Addenbrooke’s Hospital in Cambridge. According to Radda, this is part of the council’s ongoing work to make sure that the institute remains viable in the post-genomic era, but the debate is still open. The consultation period ends in July, when the committee will consider its findings.

Laura Spinney, London

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Goats to de-liver cells for transplants in India

The Indian government has agreed to fund research on the humble goat, *Capra hircus*, as a source of cells for liver transplants. If monkey trials planned for June confirm encouraging results in rats, goat hepatocytes may be transplanted into Indian patients suffering from acute liver failure before the end of the year.

“To our knowledge we are the first to show that goat is an alternative to pig for xenotransplantation,” says Chittoo Mohammed Habibullah, head of the Center for Liver Research and Diagnostics at the Deccan College of Medical Sciences. He and his colleagues have also filed a US patent.

The Indian Department of Biotechnology, which spent Rs 50 million (roughly $1 million) on the project over the last four years, has granted Rs 10.7 million for the monkey trials and for potential human experiments. The researchers’ preliminary findings are extremely promising, says Manju Sharma, secretary to the department.

Based on *in vitro* comparative studies, goat hepatocytes are similar to human fetal liver cells in both morphology and biochemical function, says Habibullah. In terms of hepatic functions like albumin synthesis, bile formation and converting ammonia into urea, he adds, “goat hepatocytes are as good as liver cells from pig or human fetus.” Last year, his group designed a bioreactor module with encapsulated goat hepatocytes—a crude bio-artificial liver support system like a dialyzer for kidney failure patients—and demonstrated its ability to detoxify ammonia to urea and to metabolize glucose (*Ind. J. Gastroenterol.* 21, 55–58; 2002).

Although pig liver cells are readily available, various risks—such as immune rejection and transmission of endogenous retroviruses to recipients—limit their use. Because Indians have for centuries bred goats for their milk, the highly domesticated animals should have a lesser chance of harboring viruses harmful to humans, Habibullah says. Goat hepatocytes may carry their own share of risks, such as prions or ruminant virus infection, experts warn. But a screening of 20 goats by the Hyderabad-based Veterinary Biological Research Institute has turned up no known pathogens or zoonotic diseases.

Habibullah says the “α-gal epitope” responsible for graft rejection is more pronounced on pig cells than on goat cells, suggesting goat cells are less likely to be rejected. For religious reasons, goats would also be more acceptable than pigs to Jews and Muslims.

K.S. Jayaraman, Hyderabad
These days, Roy Anderson is busy fielding media calls about severe acute respiratory syndrome (SARS) and working with a team of experts to investigate the escalating illness (see page 487). Anderson heads the department of infectious disease epidemiology at Imperial College in London, an advisor to the UK government on foot-and-mouth disease, and has several large grants, including £30 million from the Gates Foundation toward controlling schistosomiasis in sub-Saharan Africa.

It was not always so.

In early 2000, two independent investigations alleged Anderson had made inappropriate statements about a colleague at Oxford University, and criticized his management of the Wellcome Trust Centre for the Epidemiology of Infectious Diseases at the university. At the time, Anderson was widely considered one of Britain’s most prominent scientists; he had been head of the university’s zoology department between 1993 and 1998 and had directed the center since 1994.

The investigations polarized the university. “There [was] a destructive series of votes,” recalls Neil Ferguson, then at Oxford’s zoology department. “Zoology returned a vote of no-confidence in Roy, whereas most of the center staff voted in his confidence—the atmosphere was dreadful.”

Anderson was initially suspended and later forced to resign his post at Oxford; he also stepped down as governor of the Wellcome Trust (Nature 404, 802, 2000). “The experience taught me a lot about the less savory aspects of human nature and, indeed, about who one’s true friends were,” Anderson now says. “I had led a charmed life in terms of interactions [with people]. Now I take people less at face value, which is sad.”

While attitudes toward Anderson may have changed within Britain, his stature in the international infectious disease community remained undiminished. Anderson has stimulated the field both through his training of a new generation of scientists and through his international leadership, says Simon Levin, a renowned evolutionary biologist and biomathematician at Princeton University. “[Anderson] has been one of the most important forces for creating entirely new and powerful ways to study the dynamics of disease,” Levin says. “His mathematical approaches...have served to revolutionize the subject.”

The UK government relied heavily on Anderson’s expertise in mathematical modeling during the foot-and-mouth epidemic. The crisis coincided with his move to the new epidemiology department at Imperial College and provided an immediate focus for the department’s scientists, three-quarters of whom had followed Anderson from Oxford University.

“Foot-and-mouth disease kick-started the group,” says Brian Spratt, professor of molecular epidemiology at Imperial. “All the computers were corralled to do real-time modeling of the disease outbreak.” Spratt, who has worked alongside Anderson for five years, moved to Imperial along with nearly 70% of the center staff, including most of the researchers, secretaries, laboratory managers and administrators. “Staff feel great loyalty to Roy; that’s why they moved,” says Ferguson, now chair of mathematical biology at Imperial.

The move from Oxford to London has worked out quite well—for the most part. “I have a love-hate relationship with London,” says Anderson. “You’re closer to seats of activity such as government and societies, but in the summer I long for green fields.” But working at Imperial has distinct advantages. Whereas tenure at Oxford is as rare and precious as ‘gold dust’, Imperial has provided enough tenure-track appointments to allow Anderson to keep his interdisciplinary team together.

With that familiar team of theoretical physicists, statisticians, molecular biologists, population biologists and epidemiologists, Anderson worked hard to try and unravel the foot-and-mouth epidemic. Because the disease had such devastating consequences, there was no time to experiment with models of disease spread and control, Anderson says, adding he has never felt under so much pressure “to get it right quickly.”

Anderson’s main research focus is on HIV, however. He is currently evaluating optimal drug treatment strategies to minimize the evolution of drug resistance. The problem requires an understanding of drug pharmacology, immunology, viral replication and, most important, knowledge of human behavior in terms of compliance with drug regimens, he says. His team tries to combine these elements to create both a theoretical framework for analysis and to record real data.

He is also interested in the potential population value of HIV vaccines. “We’re entering an era where the first set of results from candidate HIV vaccines are coming through,” he says. “If [the vaccine] doesn’t protect against infection, but the vaccinated patient acquires the virus at a reduced viral load, will the vaccine be of benefit in a public health context?”

Anderson’s latest project is one that is occupying the minds of infectious disease experts worldwide. To get a handle on SARS, his team is trying to determine how connected the world is in terms of people’s mobility. “We’re asking whether, in the early stages of the SARS epidemic, you can draw conclusions about how dangerous this is on the world scale,” he says.

That Anderson is always on the cutting-edge of infectious disease research is, to some, one of the attractions of working with him. “There’s always excitement around Roy. Whenever an emerging disease happens, he’ll be in there and will get a group of very talented people to work on it,” says Spratt. “[He’s] never at the fringes of biology.”

Karen Birmingham, London