ALL THE NEWS WITHOUT FEAR OR FAVOR
The Japan Times ONLINE

Search Archives
Advanced search

Home
News
Business
Sports
Op-ed
Letters
Life in Japan
Arts and Culture
Cabinet Profiles
Cartoons
Movie Listings
Weekly News Roundup
Festivals

Services
Subscribe
購読申し込み
About us
Contact us
Privacy Policy
Advertise
広告掲載

Affiliated sites
Nifco
Shukan ST
JT Weekly
Travel Service
Travel to Japan
Book club
InterFM radio
Japan Times Jobs
ELEC
Study abroad
Business jet charter
Hotel bargains
World wide hotels
Simmons
Ohto
Nifsan

NATURAL SELECTIONS

Lice of a feather grow together

By ROWAN HOOPER

Look at the history of modern global infections and you'll see a worrying pattern. For example, evidence of SARS, which killed 916 people worldwide this year, was discovered in civets and raccoon dogs sold live at Chinese food markets. Yuen Kwok-yung, head of microbiology at the University of Hong Kong, said it is "highly likely" that the virus jumped from the animals to humans.

Another disease, the Nipah virus, emerged in Malaysia in 1999 and killed more than 100 people. Scientists found that it had jumped from pigs to humans, but had originated in bats. Then there's eastern equine encephalitis -- "Triple E" -- a rare but potentially fatal disease affecting horses. It normally resides in birds. Like the deadly West Nile Virus, it is spread by mosquitoes and has jumped species to infect humans.

And the most devastating of modern diseases, AIDS, is caused by HIV, a virus that crossed from chimpanzees to humans sometime in the 1930s. Five million new infections of the virus -- the highest ever for a single year -- were recorded in 2003, and 3 million deaths. Forty million people worldwide are now infected with HIV and 15,000 more become infected each day.

Clearly, diseases that cross the species barrier are a major problem, and one of the most pressing medical issues in the world. More than half of all known species are parasites, or bacteria and viruses that act like parasites. Why do these disease-causing organisms cross the species barrier?

Evolutionary ecologist Dale Clayton at the University of Utah is working on a research program in an effort to find an answer. It's an important job, but a lousy one: He infects pigeons and doves with lice to see why some species of lice live on certain species of birds.

The study "is one of the best demonstrations to date of why parasites are often specific to a single species of host and under what conditions they jump hosts," Clayton said. "This is of strong interest to the public, particularly when it concerns parasites such as SARS and the West Nile Virus," he added.

Clayton and colleagues showed that for parasites, size matters: Lice only infest bird species that have feathers of the right size, enabling the insect to hide between individual "barbs" -- the hairlike branches that extend from the shaft of each feather. Lice have evolved to hide in the feathers, so that the birds cannot preen them off with their beaks. The work was published this week in the journal Proceedings of the National Academy of Sciences.

"Sometimes parasites from domestic animals switch to humans and sometimes

they don't," said Sarah Bush, a coauthor of the study. "So looking at how parasites on birds switch to other species of birds may help us understand how parasites from mammals switch to humans."

The researchers analyzed genetic material from 19 species of lice and 24 species of pigeons and doves. That allowed them to construct evolutionary family trees for the lice and the birds, showing how each species was related to or descended from other species over the last 30 million years.

The evolutionary trees revealed that louse species evolved in concert with various species of pigeons and doves they infest. As a result, "big birds have big lice, small birds have small lice," said Bush.

"We have shown that something as simple as the changing size of a parasite's environment -- the bird feather -- can cause new species of lice to form," Clayton said.

"Our research suggests that humans don't pick up lice from chimps and baboons because those lice evolved to hang on to coarser hair," he added.

We humans do have as many hairs on our bodies as chimps, but human hair is much finer, so we appear to be naked apes.

In one experiment, the researchers started with louse-free pigeons and doves of four species, ranging in weight from about 3.5 to 6 grams. Then they transferred 25 lice that normally infest a larger species (rock pigeons), to birds from the other four smaller species.

After two months, the scientists counted the number of lice on each bird and found big lice couldn't survive on small birds because they couldn't hide in the feathers.

"This study suggests that birds and lice co-evolve in an arms race over time, with lice changing size as birds do, their beaks and feathers also change size," Clayton said.

And in the paper the biologists conclude: "Host defense constrains host switching by exerting strong selection against lice transferred to novel hosts differing in size from the native host."

Clayton admitted that his study was not immediately relevant to "crossover" viruses such as SARS and West Nile, but said: "If we know why parasites use some hosts and not other hosts, then we can begin to predict what hosts may get hit in the future by a given parasite."

Rowan Hooper is a researcher at Trinity College, Dublin. He welcomes comments at rowan.hooper@tcd.ie

The Japan Times: Dec. 11, 2003