

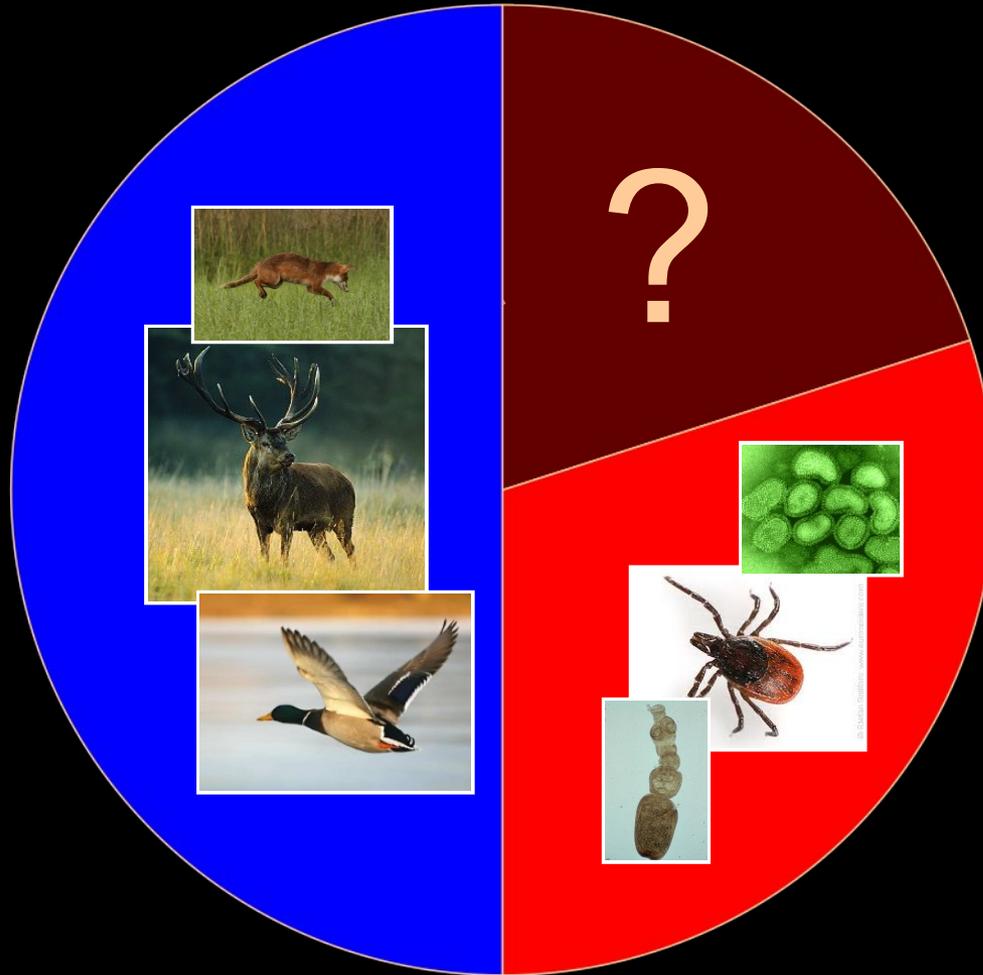
# Écologie de la Santé et Biodiversité : les gestionnaires face aux maladies émergentes



M. Vittecoq & M. Gauthier-Clerc



# Les parasites : une part importante de la biodiversité



# Santé et maladies infectieuses

## Phase d'optimisme

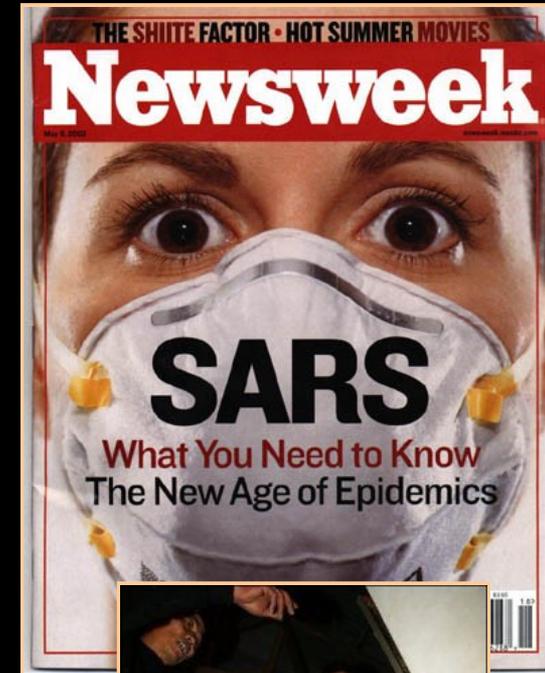


Traitements antibiotiques

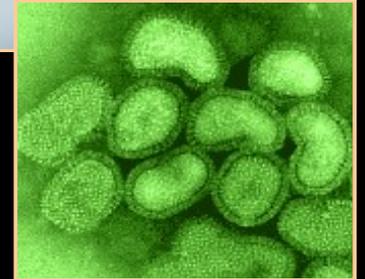
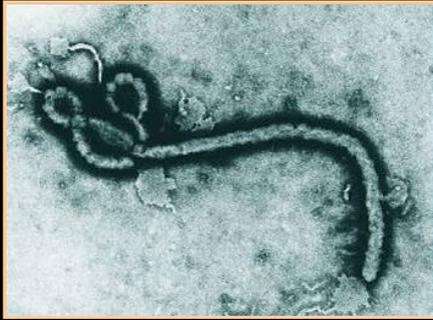


Eradication de la variole (1979)

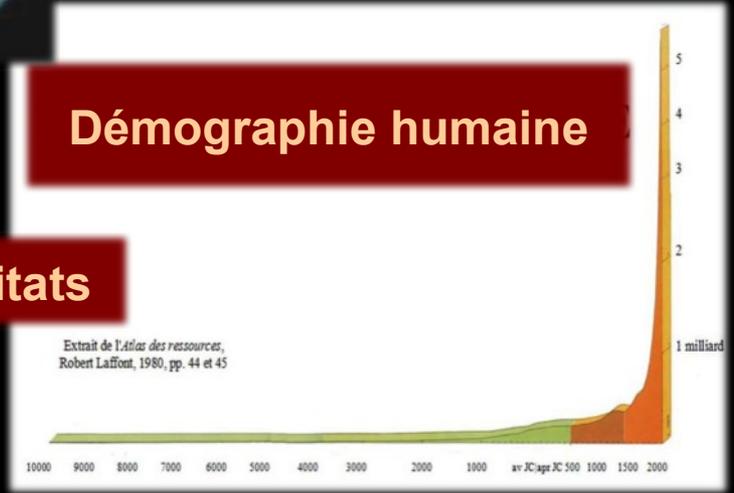
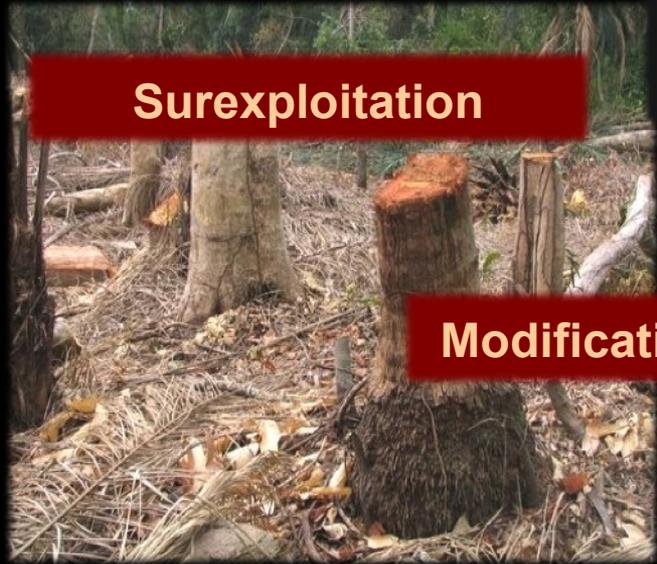
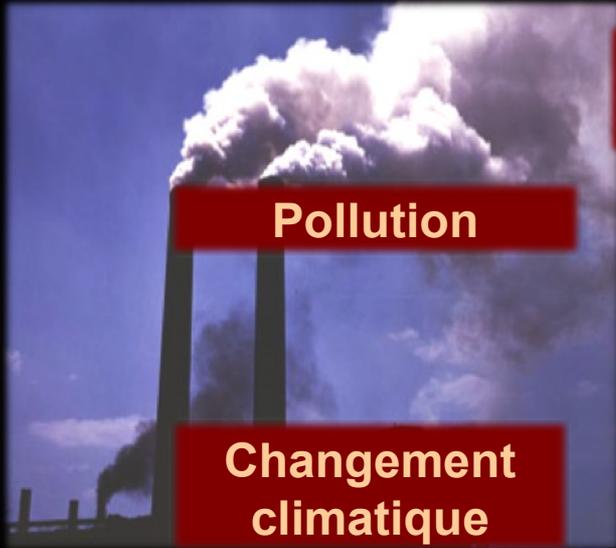
# Crise sanitaire marquée par l'émergence de pathogènes dans les populations humaines et d'animaux domestiques



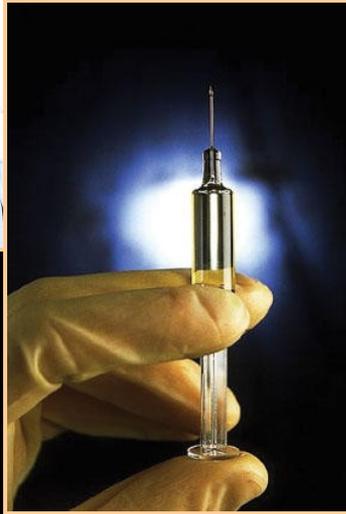
# 75% des pathogènes émergents sont zoonotiques



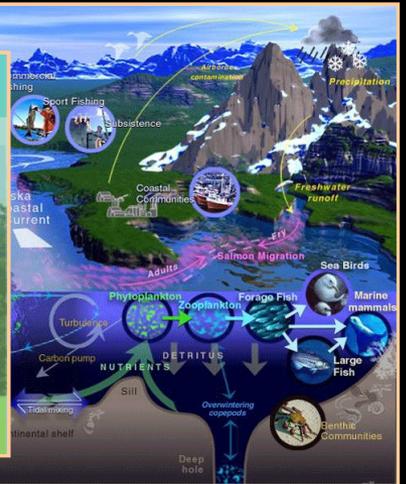
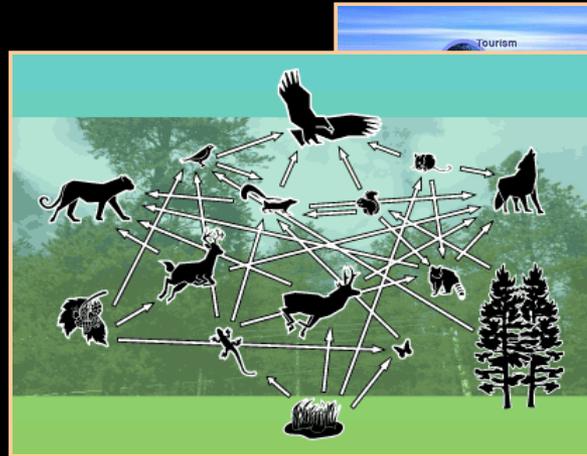
# Deux crises sous l'effet des changements globaux : Une crise écologique et une crise sanitaire



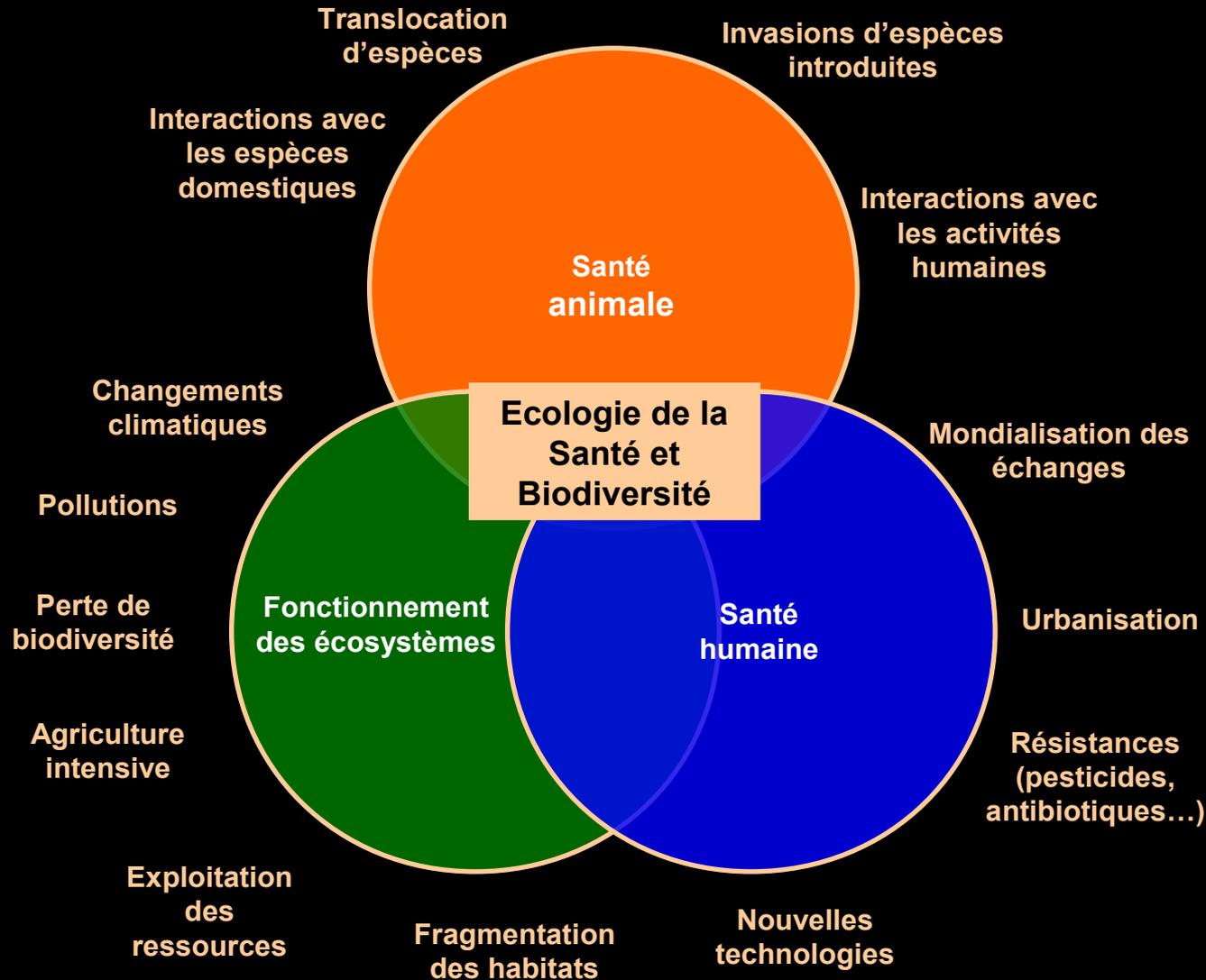
# Monde de la santé



# Monde de l'écologie

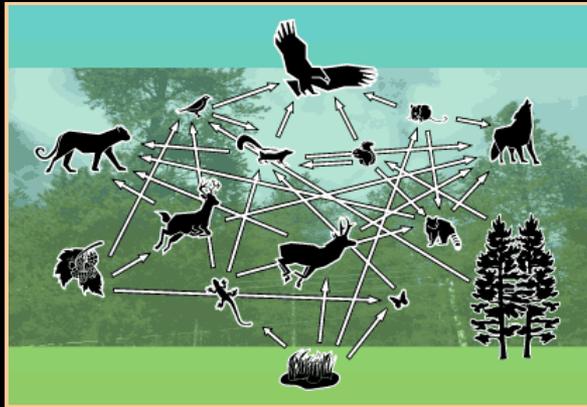


**Crises sanitaire et de la biodiversité ➔ origine en partie commune :**  
augmentation des perturbations environnementales dues aux activités humaines



# Ecologie de la Santé et Biodiversité

Etude des populations d'hôtes



Recherche de vaccins

Etudes médicales



Recherche de traitements

Surveillance des maladies infectieuses



Etudes vétérinaires

# Surveillance des maladies infectieuses



## Historique chez les animaux sauvages en France

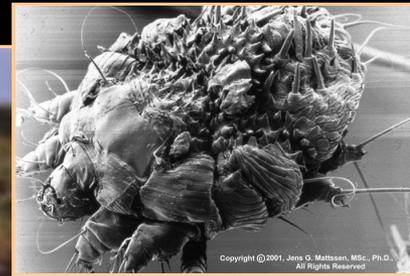
- . Etudes sur les maladies des animaux sauvages relativement récentes en épidémiologie.
- . 1968: arrivée en France de la rage vulpine  
Plan d'éradication novateur et efficace: vaccination orale des renards.
- . Création du réseau SAGIR, dispositif national de surveillance sanitaire du gibier,
- . Fin des années 1990: ministères chargés de l'Agriculture et de l'Environnement et le monde cynégétique s'en préoccupent de plus en plus (risques pour animaux domestiques et hommes)



# Enjeux de la surveillance

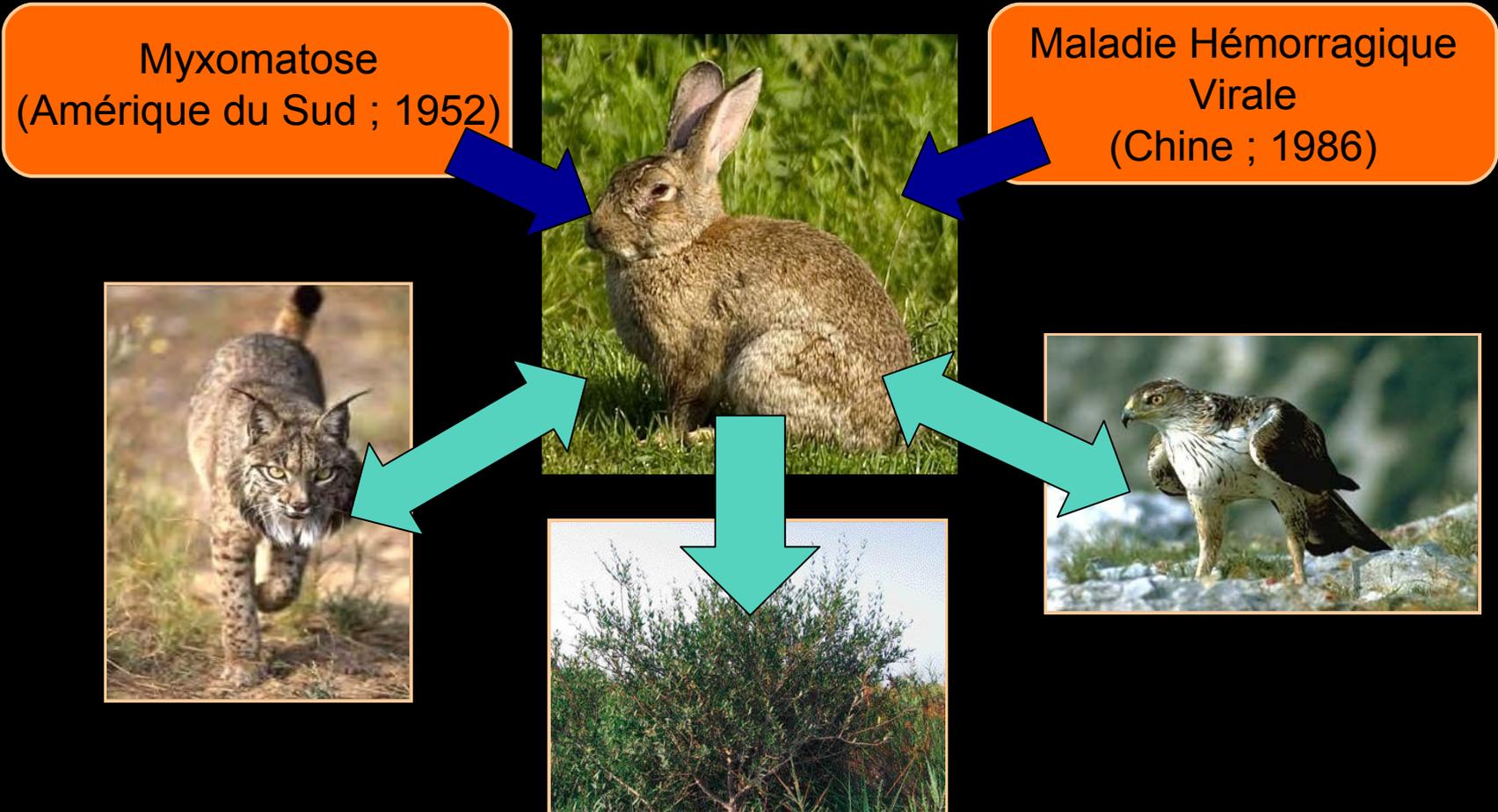
- **Enjeu patrimonial** : conservation d'espèces

Gale sarcoptique et brucellose ont décimé certaines populations de bouquetins ibériques (*Capra pyrenaïca*).



# Enjeux de la surveillance

- Enjeu patrimonial
- **Enjeu scientifique** : inventaire des agents pathogènes, leur écologie, leurs risques futurs, rôle de la maladie dans le fonctionnement des écosystèmes

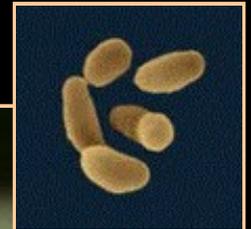


# Enjeux de la surveillance

- Enjeu patrimonial
- Enjeu scientifique
- **Enjeu cynégétique** : qualité et quantité du gibier



**Trichinellose**



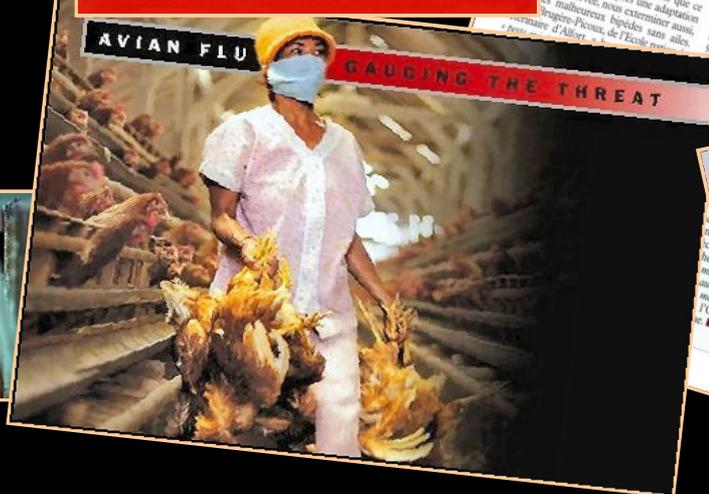
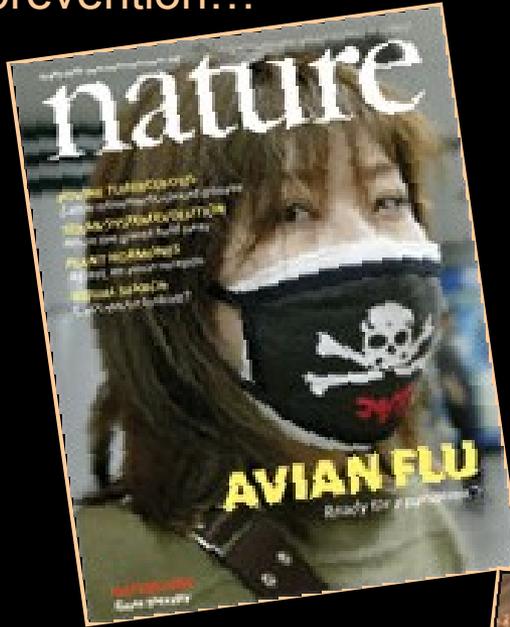
**Tularémie**

# Enjeux de la surveillance

- Enjeu patrimonial
- Enjeu scientifique
- Enjeu cynégétique
  
- **Enjeu économique:** Impact sur les animaux domestiques, mesures de prévention...

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**Les oiseaux migrateurs : des boucs émissaires de la dispersion du virus H5N1 ?**



Almost as soon as H5N1 avian influenza began its deadly sweep across Asia, people fingered migratory birds as likely culprits in its spread. Migrating birds offer an obvious way to connect the dots of H5N1 outbreaks along the east coast of Asia and, in just the past few months, its unexpected cross-continent jump to Siberia, Kazakhstan, and Turkey. Moreover, researchers have long known that these birds commonly harbor less virulent flu viruses, and many wild birds mingle with Asia's free-ranging domestic poultry, which have been decimated by H5N1.

But avian experts have been almost universally skeptical that wild birds are spreading the virus. One reason is that sampling of tens of thousands of birds has failed to turn up a single healthy wild bird carrying the pathogenic strain of H5N1, which has caused the death of millions of birds at least in Asia. Evidently, birds that are sick and dying are likely to die as they fly. Ducks, for example, are the refrain, as avian experts say, "It is very difficult to control the spread from country to country." Nailing down the answer became even more urgent last week with the confirmation that H5N1 has now entered Europe.

Even before that confirmation, the Netherlands ordered farms along migratory routes to keep poultry inside, and three German states asked farmers to voluntarily take similar precautions. Last month, the European Commission rejected proposals to extend such measures throughout the union, but E.U. officials were reassessing their stance with the news that H5N1 has reached Turkey (see p. 417). Everyone recognizes that if wild birds are involved, new strategies will be needed to halt the virus's spread to

domestic flocks—and from them to people. A growing number of scientists and organizations are calling for dramatically increased global surveillance to profile all viruses circulating in wild birds. Says Kennedy Shorbridge, a virologist and professor emeritus at the University of Hong Kong, "H5N1 is important, but we still need to be on the lookout for other flu viruses." The costs of surveillance are small, he says, considering the damage that could be done to the poultry industry—or, worse, the potential for a human pandemic.



**Heads up.** Researchers worry that bar-headed geese might carry the H5N1 virus from the sites of outbreaks in northern China and Mongolia to India and Bangladesh.

mind, he says, was the death of 100 or so ducks, gulls, geese, and swans from H5N1 at a remote lake in Mongolia that he believes can't be explained by human activities. And, he and others add, in an unexpected twist, it's beginning to look as though the culprit might not be the long-suspected migratory waterfowl but another yet-unidentified wild species.

The implications are huge. If wild birds are carrying the disease, says Suarez, "it will be difficult or impossible to control the spread from country to country." Nailing down the answer became even more urgent last week with the confirmation that H5N1 has now entered Europe.

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**From low to high**  
One reason migratory waterfowl were high on the list of suspects for spreading H5N1 is because they are natural hosts for other bird flu viruses. But Iliana Capua, a virologist at Italy's National Reference Laboratory for Avian Influenza in Padua, warns that Anatidae, the family that includes ducks and geese, are as genetically distant from gallinaceous birds (chickens, turkeys, and quail) as cats are from dogs. The different families interact with viruses very differently, she says.

Viruses are subtyped by the forms of two of their surface glycoproteins, hemagglutinin (H) and neuraminidase (N). There are 16 forms of hemagglutinin and nine of neuraminidase. Viruses are further classified as being of low or high pathogenicity. Low-pathogenicity viruses are typically carried in a bird's intestinal and respiratory tracts and usually cause mild or no symptoms. Highly pathogenic viruses can infect cells throughout a bird's body and cause systemic disease and, usually, death.

Waterfowl have been shown to carry low-pathogenicity viruses of virtually all possible combinations of H and N, including low-pathogenicity versions of H5N1. So far, however, there is no known natural reservoir for



with the U.S. Department of Agriculture's (USDA's) Southeast Poultry Research Laboratory in Athens, Georgia. "But now I feel that there is much stronger evidence that wild birds are spreading the virus." What changed his

# Enjeux de la surveillance

- **Enjeu économique:** Impact sur les animaux domestiques, mesures de prévention...

## Virus Influenza A : 2 formes de pathogénicité



- Une faible : Les oiseaux sauvages constituent une source permanente de souches faiblement pathogènes



- Une forte : Depuis une cinquantaine d'années, épisodes de mortalité chez les oiseaux domestiques.



# Enjeux de la surveillance

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- Enjeu cynégétique
- Enjeu économique
- **Enjeu de santé publique**, quand la maladie est transmissible à l'homme



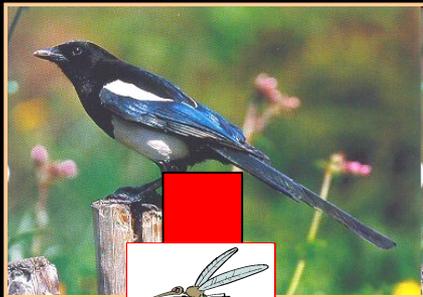
Maladie de Lyme



Échinococcose alvéolaire

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West Nile



# Ecologie de la Santé et Biodiversité

## Vers une santé unique

**Un objectif :** Mieux comprendre les dynamiques des agents pathogènes pour prévenir les crises sanitaires et réagir efficacement quand elles surviennent

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**Un rôle** important à jouer pour les gestionnaires, notamment via la surveillance des maladies infectieuses au sein de la faune sauvage

**Merci !**

