L’environnement comme interface de la santé humaine et animale

Serge Morand
Une préoccupation ancienne
Intergovernmental conference of experts on the scientific basis for rational use and conservation of the resources of the biosphere

Paris
4-13 September 1968

RECOMMENDATION 3

RESEARCH ON HUMAN ECOLOGY

The Conference,

Considering that man is an integral part of most ecosystems, not only influencing but being influenced by his environment; that his physical and mental health, now and in the future, are intimately linked with the dynamic system of natural objects, forces and processes that interact within the biosphere and including also those of man's culture,

Recommends to the Member States and their appropriate institutions, to Unesco, WHO and the international organizations concerned:

1. That research be directed to man's basic ecology and to his social and physical adaptability to the changes of all kinds to which he is being subjected, whether in simple or in more complex societies, including those that are highly technological and urbanized.

2. That continuing and intensified research be undertaken on the ecology of human diseases, with special reference to those associated with environmental change and to the zoonotic diseases arising from interactions between man and animals.

3. That this research be directed at solving increasingly important problems of the establishment of the necessary balance between man and his environment in relation to the maintenance of his health and well-being in their broadest connotations.
The concept of planetary health is based on the understanding that human health and human civilisation depend on flourishing natural systems and the wise stewardship of those natural systems.

Solutions lie within reach and should be based on the redefinition of prosperity to focus on the enhancement of quality of life and delivery of improved health for all, together with respect for the integrity of natural systems.

The present systems of governance and organisation of human knowledge are inadequate to address the threats to planetary health.
Une épidémie d’épidémies
Increasing number of outbreaks and emerging infectious diseases

Number of outbreaks and diseases with outbreaks over time.

Increasing global outbreaks

Local/Regional to global

Morand & Figuié 2018
Pertes de biodiversité et risques zoonotiques

high biodiversity

Mammal Species richness

→

high number of infectious diseases in a country

(Schipper et al. 2011)

high biodiversity at threat

Mammal Species at threat

→

high number of ID outbreaks

(Morand & Lajaunie 2017)
L’importance de la domestication animale
La révolution néolithique
Tempo et lieux de la domestication animale
Les animaux apprivoisés et commensaux
Le nombre de maladies infectieuses partagées entre les animaux domestiques et les humains est corrélé à la longueur de temps depuis leur domestication.
Analyse en réseau confirme la relation entre partage de maladies infectieuses et temps de domestication
Parasitic and microbial agents

Morand et al. In prep
Une communauté de partage des infections

Confirmation du lien partage de maladies infectieuses et temps de domestication
La ferme globale accroît les risques
Une planète dominée par les animaux domestiques

(Morand & Lajaunie, 2017; données de Vaclav Smill)
Data Descriptor: Global distribution data for cattle, buffaloes, horses, sheep, goats, pigs, chickens and ducks in 2010

Marius Gilbert\(^1,2\), Gaëlle Nicolas\(^3\), Giusepina Cinardi\(^3\), Thomas P. Van Boeckel\(^4,4\), Sophie O. Vanwambeke\(^5\), G. R. William Wint\(^2\) & Timothy P. Robinson\(^6\)
Une planète dans la bouse

Global faecal pollution by humans and their livestock
=> 26 billions tons of feces per year

A dairy cow (600 kg) => 10 kg per day
A pig (60 kg) => 2.7 per day
A chicken (2 kg) => 100 g per day
Global Cryptosporidium Loads from Livestock Manure

Lucie C. Vermeulen,*,† Jorien Benders,† Gertjan Medema,‡§ and Nynke Hofstra†

320 thousand of trillions of oocysts per year
Une planète dominée par l’agro-industrialisation

More meat

- More meat
- Less biodiversity
- More antibiotics and biocides
- More health crises
- More biodiversity losses
Global trends in antimicrobial use in food animals

Thomas P. Van Boeckel\textsuperscript{a,1}, Charles Brower\textsuperscript{b}, Marius Gilbert\textsuperscript{cd}, Bryan T. Grenfell\textsuperscript{a,e,f}, Simon A. Levin\textsuperscript{a,g,h,1}, Timothy P. Robinson\textsuperscript{1}, Aude Teillant\textsuperscript{a,e}, and Ramanan Laxminarayan\textsuperscript{b,e,i,1}

\textbf{Fig. 3.} Global antimicrobial consumption in livestock in milligrams per 10 km\textsuperscript{2}

\textbf{Fig. 4.} Antimicrobial consumption in chickens (A) and pigs (B) in 2010. Purple indicates new areas where antimicrobial consumption will exceed 30 kg per 10 km\textsuperscript{2} by 2030.

\textbf{PHARMACEUTICALS}

\textit{China’s lakes of pig manure spawn antibiotic resistance}

Researchers begin to size up a public health threat from burgeoning pork production.
Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study

Yi-Yun Liu*, Yang Wang*, Timothy R Walsh, Ling-Xian Yi, Rong Zhang, James Spencer, Yohei Doi, Guobao Tian, Baolei Dong, Xianhui Huang, Lin-Feng Yu, Danxia Gu, Hongwei Ren, Xiaojie Chen, Luchao Lv, Dandan He, Hongwei Zhou, Zisen Liang, Jian-Hua Liu, Jianzhong Shen

Clonal transmission of a colistin-resistant Escherichia coli from a domesticated pig to a human in Laos

Abiola Oluumuyiwa Olaitan1, Baupha Thongmalayvong2, Kongsav Akkhavong2, Silaphet Somphavong2, Phimpha Paboriboune3, Syseng Khousny4, Serge Morand2 and Jean-Marc Rolain5

Dissemination of the mcr-1 colistin resistance gene

Abiola Oluumuyiwa Olaitan, Safara Chabou, Liliane Okdhah, Serge Morand, *Jean-Marc Rolain

Lancet Infect Dis 2015
Pour une social-écologie de la transmission
Asie du Sud-est
Un théâtre social-écologique
Hotspots of human impact on threatened terrestrial vertebrates

James R. Allan¹,², James E. M. Watson¹,²,³, Moreno Di Marco¹,⁴, Christopher J. O’Bryan¹,², Hugh P. Possingham²,⁵, Scott C. Atkinson²,⁶, Oscar Venter⁷
La crise sanitaire s’est traduite par :
- Le décès de 105 personnes sur les 265 infectés
- Plus d’un million de cochons abattus

Mouvements des chauve-souris

Fermes porcines en Malaisie pour le marché régional (Singapour)
Ecologie de transmission entre faune sauvage et animal domestique
Distinct spread of DNA and RNA viruses among mammals amid prominent role of domestic species

Konstans Wells, Serge Morand, Maya Wardeh, Matthew Baylis

2019, et soumis
Emerging Infectious diseases, wildlife, domestic animals

(Formenty P, WHO)
Ecologie de transmission et les changements d’usage des terres
Changing landscapes of Southeast Asia and rodent-borne diseases: decreased diversity but increased transmission risks

Accroissement des risques zoonotiques avec l’extension agricole et l’urbansiation

Association of rodent-borne Leptospira spp. with urban environments in Malaysian Borneo
Agricultural land-uses consistently exacerbate infectious disease risks in Southeast Asia

Hiral A. Shah\textsuperscript{1,2}, Paul Huxley\textsuperscript{1,2}, Jocelyn Elmes\textsuperscript{1,3} & Kris A. Murray\textsuperscript{1,2}
Merci pour votre attention