

Fongicides agricoles et résistance chez des pathogènes pour l'homme et les animaux

Steffi ROCCHI

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Chloé Godeau, Nadia Crini, Grégorio Crini, Audrey Laboissière,
Sylvie Dousset, Fabrice Martin-Laurent, Sandrine Petit-Michaut,
Clémentine Fritsch et le consortium pepsan

Pesticides :
AZOLES FUNGICIDES



Ecosystem pollution
Impact non-target species
Decrease in biodiversity
RESISTANCE

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- Phytopathogens
- Non-target molds

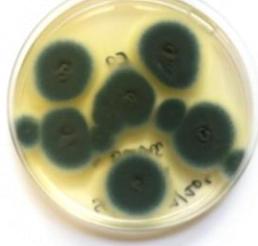
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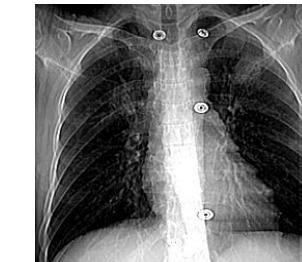
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Aspergillus fumigatus



ASPERGILLOSIS



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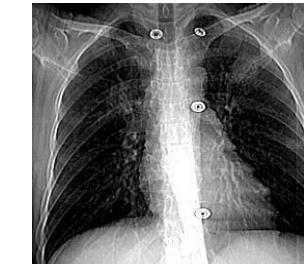
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HUMAN : immunocompromised patients ++, cystic fibrosis, flu, COVID ...

ANIMALS : wild and domestic terrestrial and aquatic ecosystems
(not described as a plant pathogen)

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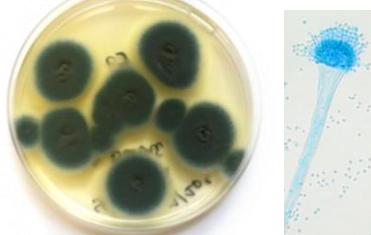
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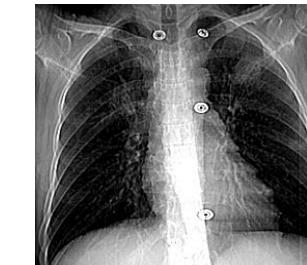
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"environnemental"
Mutations
(TR₃₄/L98H)

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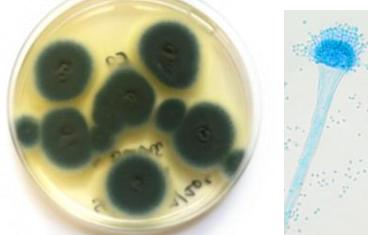
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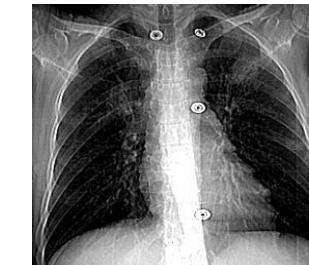
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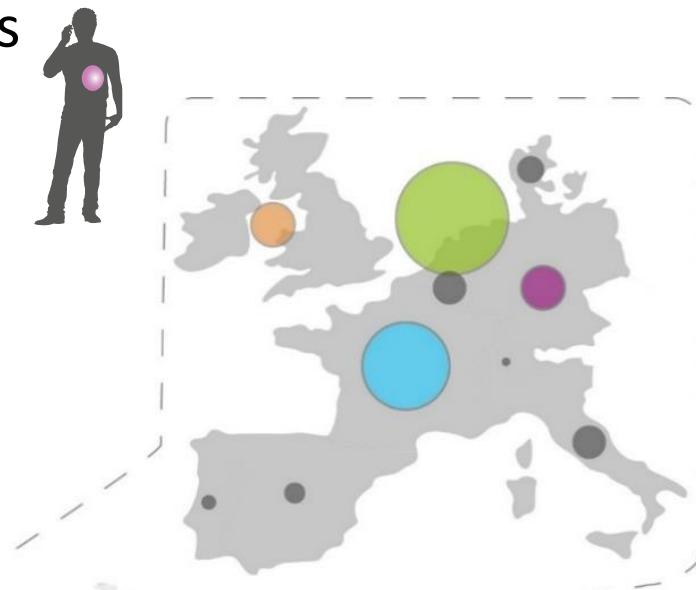
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PUBLIC HEALTH ISSUE (?)

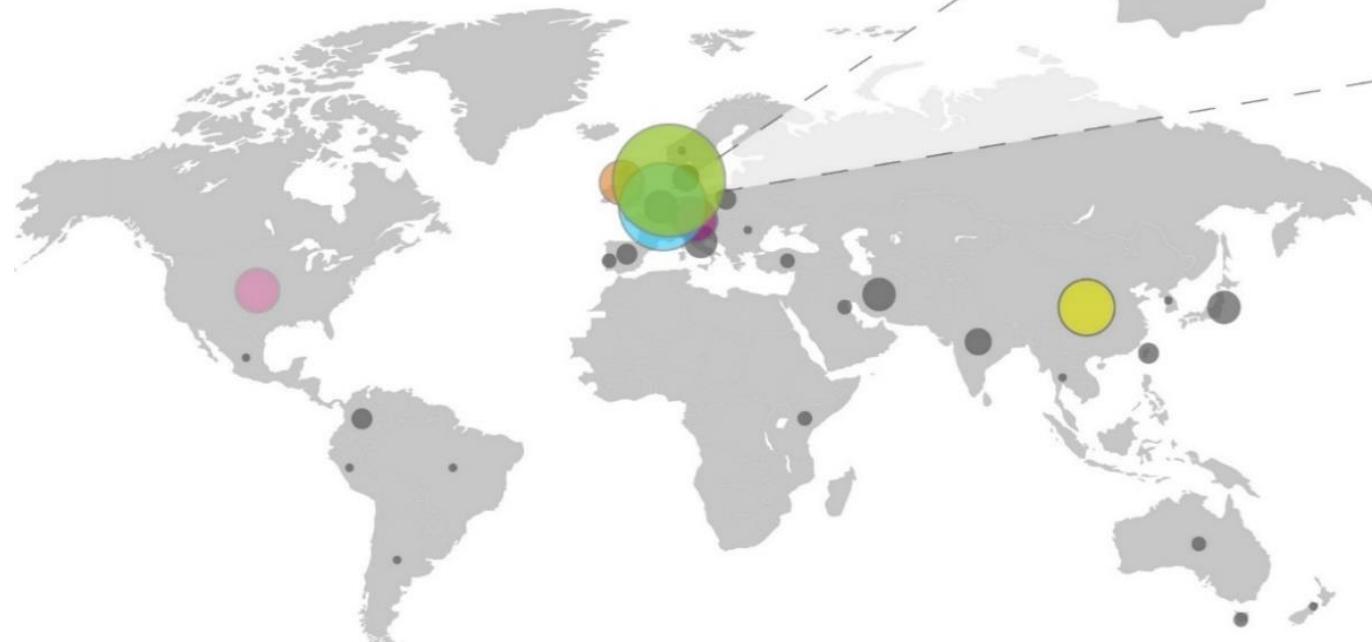
- 1st case of *A. fumigatus* resistance published in 1997: Netherlands
 1st to make wide use of azoles in agriculture
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**Presence of
"environmental"
resistance: Assessment
in 2020**



1st French case of infection in 2011 / M. A : farmer

A. fumigatus resistant mutation TR₃₄/L98H (environment)

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A. fumigatus resistant mutation TR₃₄/L98H (environment)



Fields treated with azoles (prothioconazole & epoxiconazole)
= 1 *A. fumigatus* mutation TR₃₄/L98H



⇒Link with environment

- Sawmills Franche-Comté

Environmental chemistry collaboration - azoles

A. fumigatus TR₃₄/L98H

Link propiconazole & tebuconazole



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Resistant strains link with difenoconazole

TR₃₄/L98H ++ & TR₄₆/Y121F/T289A



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BUT Difenoconazole in 2 sites : Ø resistance

⇒ Influence of soil type?

⇒ Special conditions of resistance selection ?



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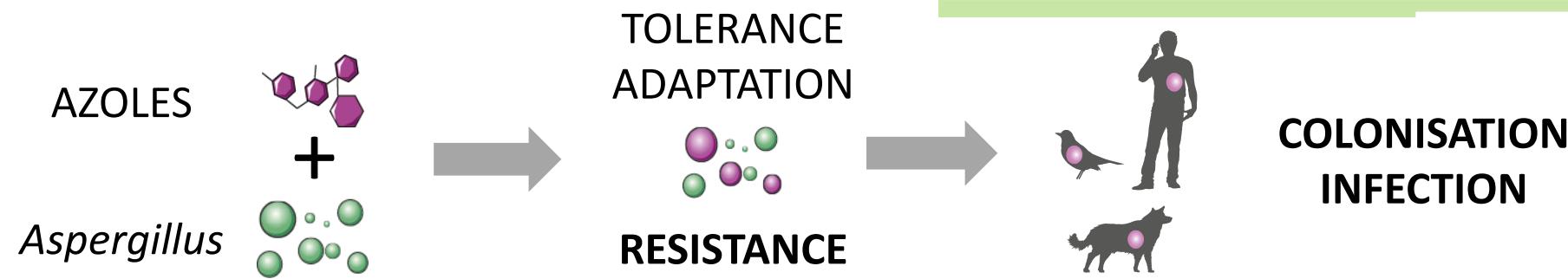
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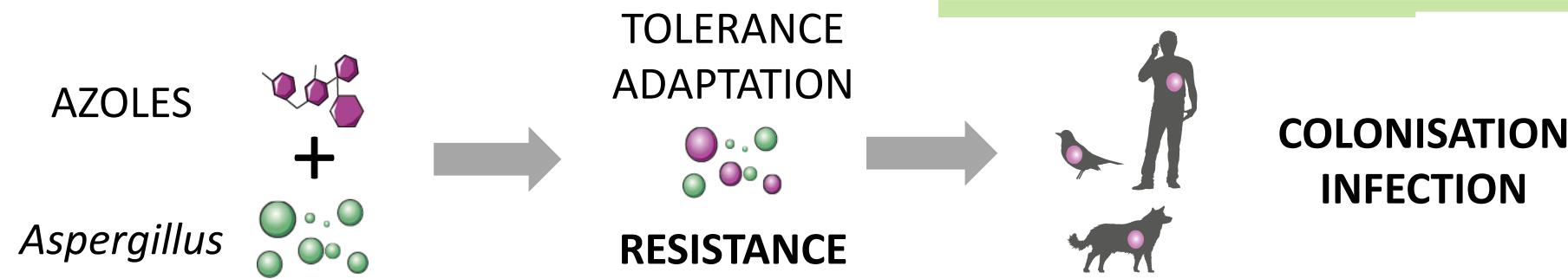
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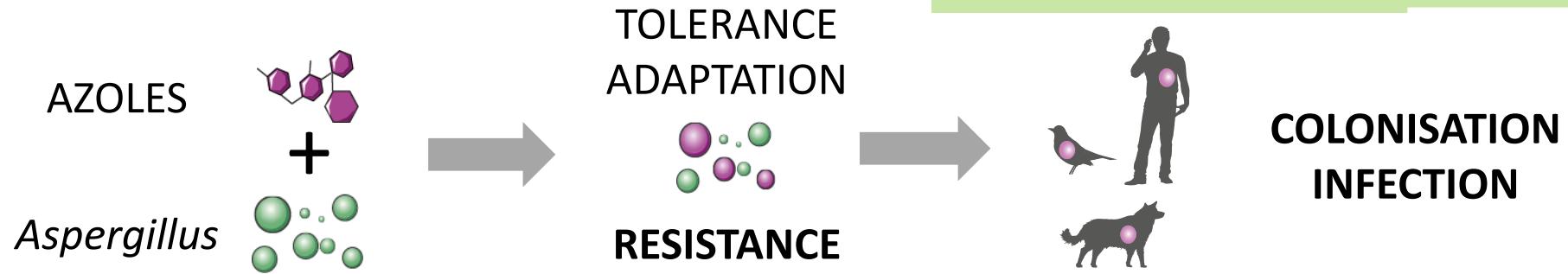


- Which strains are involved ?

Two large clades of *A. fumigatus* (resistant - susceptible)

Sexual reproduction role (recombination ++ TR / SNPs)

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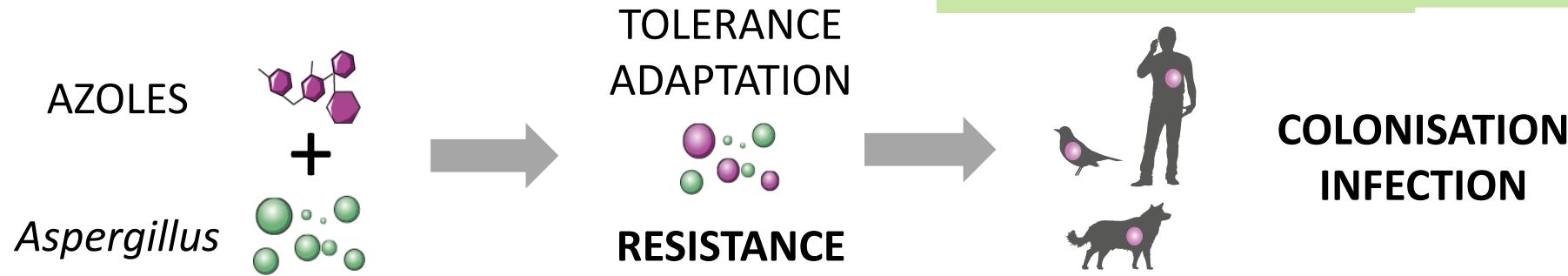
Metabolic plasticity: environmental stressors / virulence and adaptability

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⇒ abiotic and biotic prop of the soils ?



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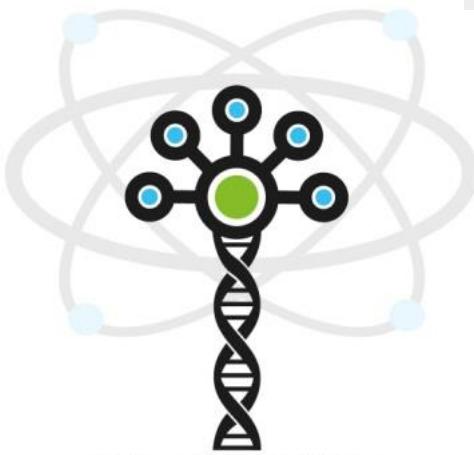
- Dissemination to at-risk populations ?

Airborne + Transportation (individuals – commercial products)

Which individuals are at risk?

250

resistant isolats

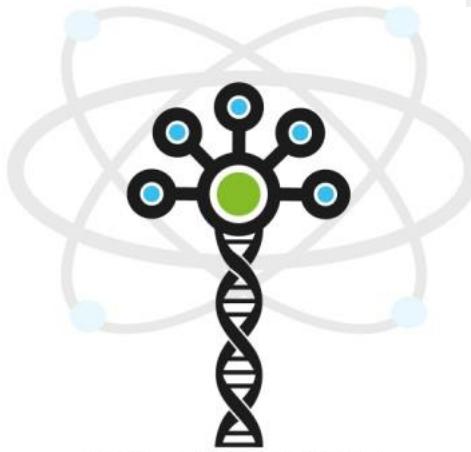


DAT-Af-BASE

Base de données : DAT-Af-BASE : base de données des *Aspergillus fumigatus* résistants aux azolés

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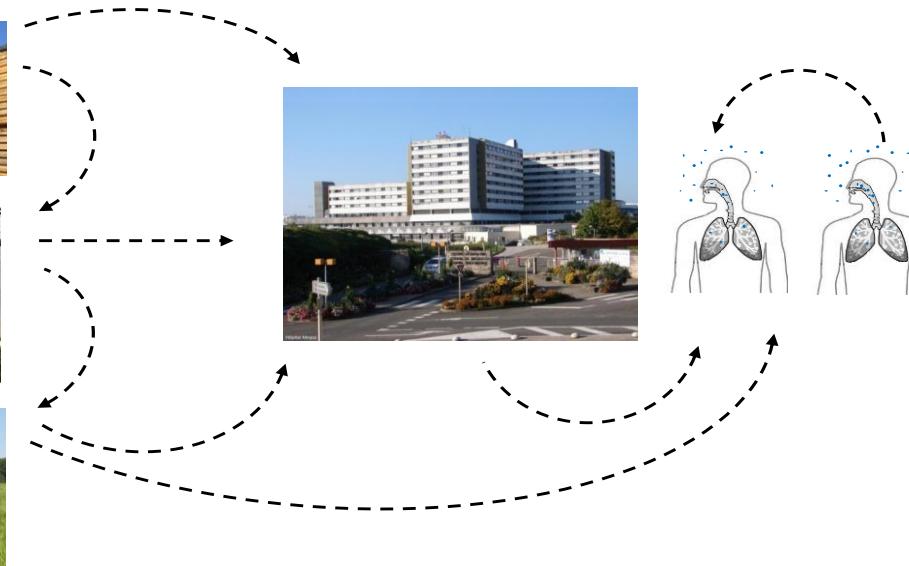
DAT-Af-BASE

"Local"
resistance

⇒ Regional clones ?

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Hotspot of resistance



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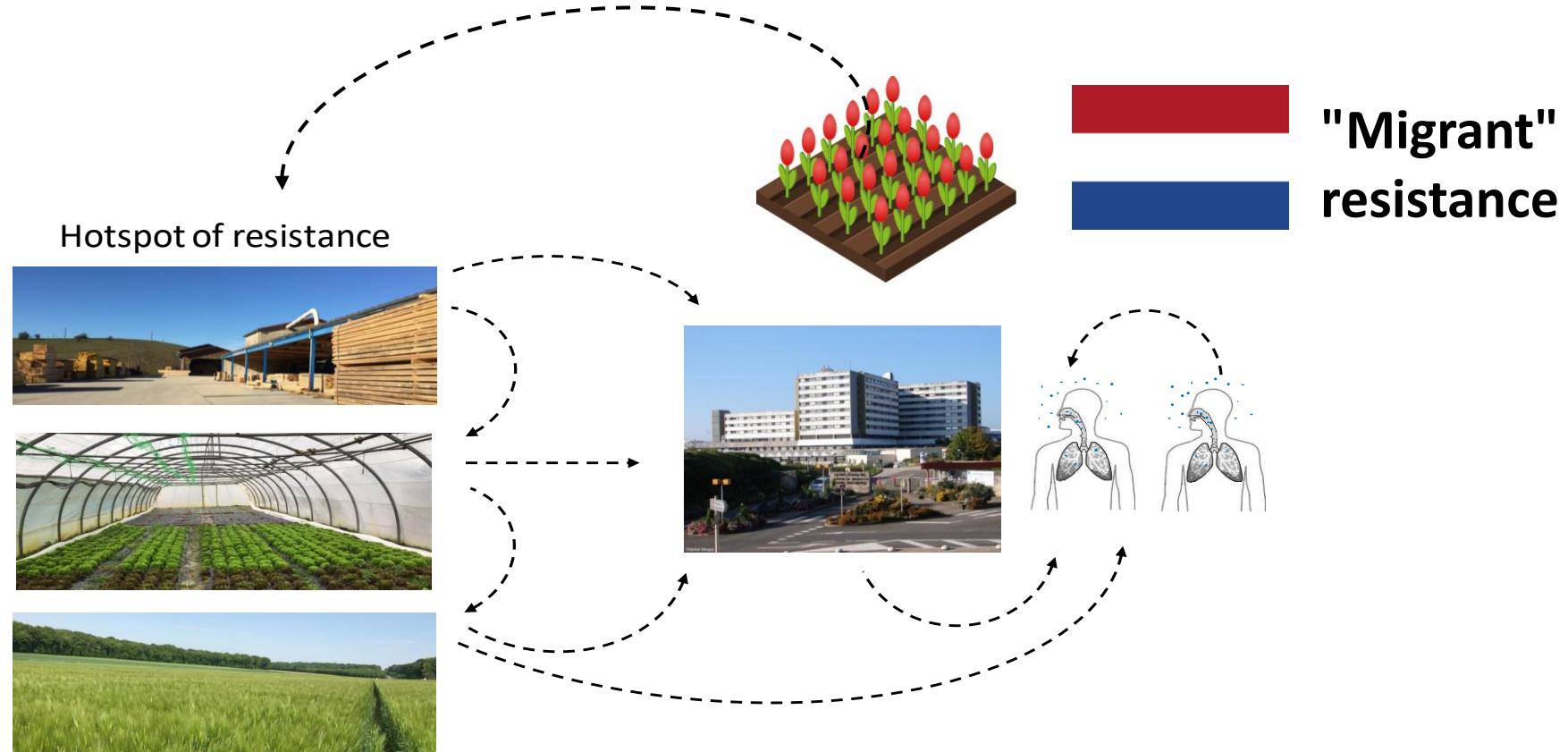


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... And resistance selection conditions to be studied

PhD Chloé Godeau (N. Crini chimie environnementale – S. Rocchi microbiologie)
Triazole fungicides in farm soils : dissemination, impact and remediation

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Physico-chemical properties of agricultural soils

Hypothesis :

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Agroécologie
Dijon
Unité de Recherche

F. Martin-Laurent
S. Petit-Michaut

Sampling - cereal fields :
Soil characterization
⇒ Link with Resistance ?

Comparison between soils :
- Lorraine
- Bourgogne-Franche-Comté



S. Dousset
INRAE Mirecourt



SAD ASTER Mirecourt, Farmers Network ZAM

Landscape platform Fénay

Treatment history since 2004

RESISTANCE HOSPOTS ?

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~~Field Session March 2020~~

Field session Sept 2020 :



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Field session Sept 2020 :
11 plots **Vosges/Moselle** (same molecules – wheat)



Lieu	Traitements	Type de sol
Mirecourt	Bio	Argileux
Mirecourt	Bio	Limono-argileux
Moselle	TEBU/PROTHIO	Argileux
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Analyses in progress ...

Fénay :
Field session March/April 2021

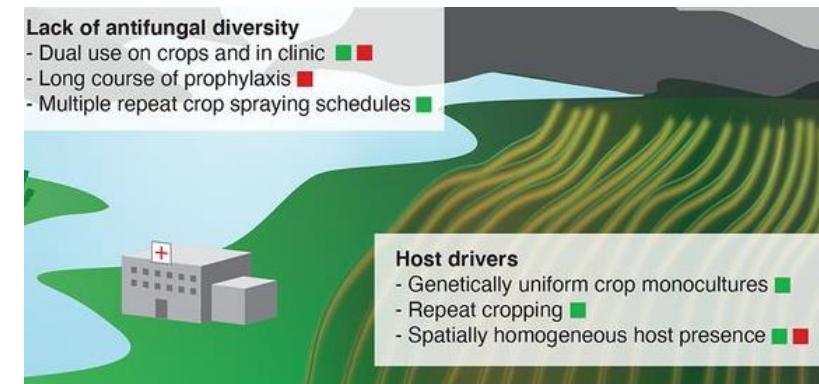
Lorraine : New spring session?

RESISTANCE HOSPOTS ?

AZOLEs
abiotic and biotic
factors ?

AZOLEs

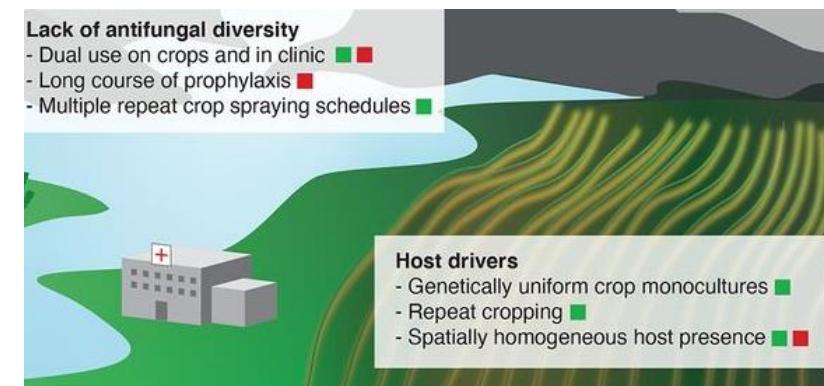
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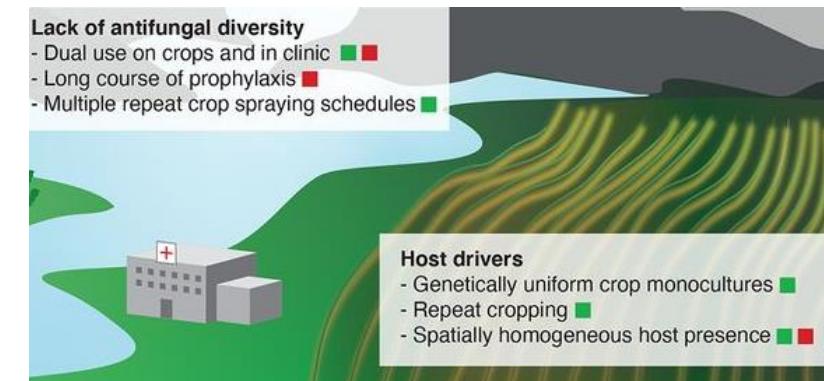
Communities able to biodegrading azoles

UMR Agroécologie,
projet région STOP (oct 2020)
Development of new toxicity
markers pesticides on
non-target organisms

IMPACT
ecotoxicity non-target organisms ?

AZOLES
abiotic and biotic
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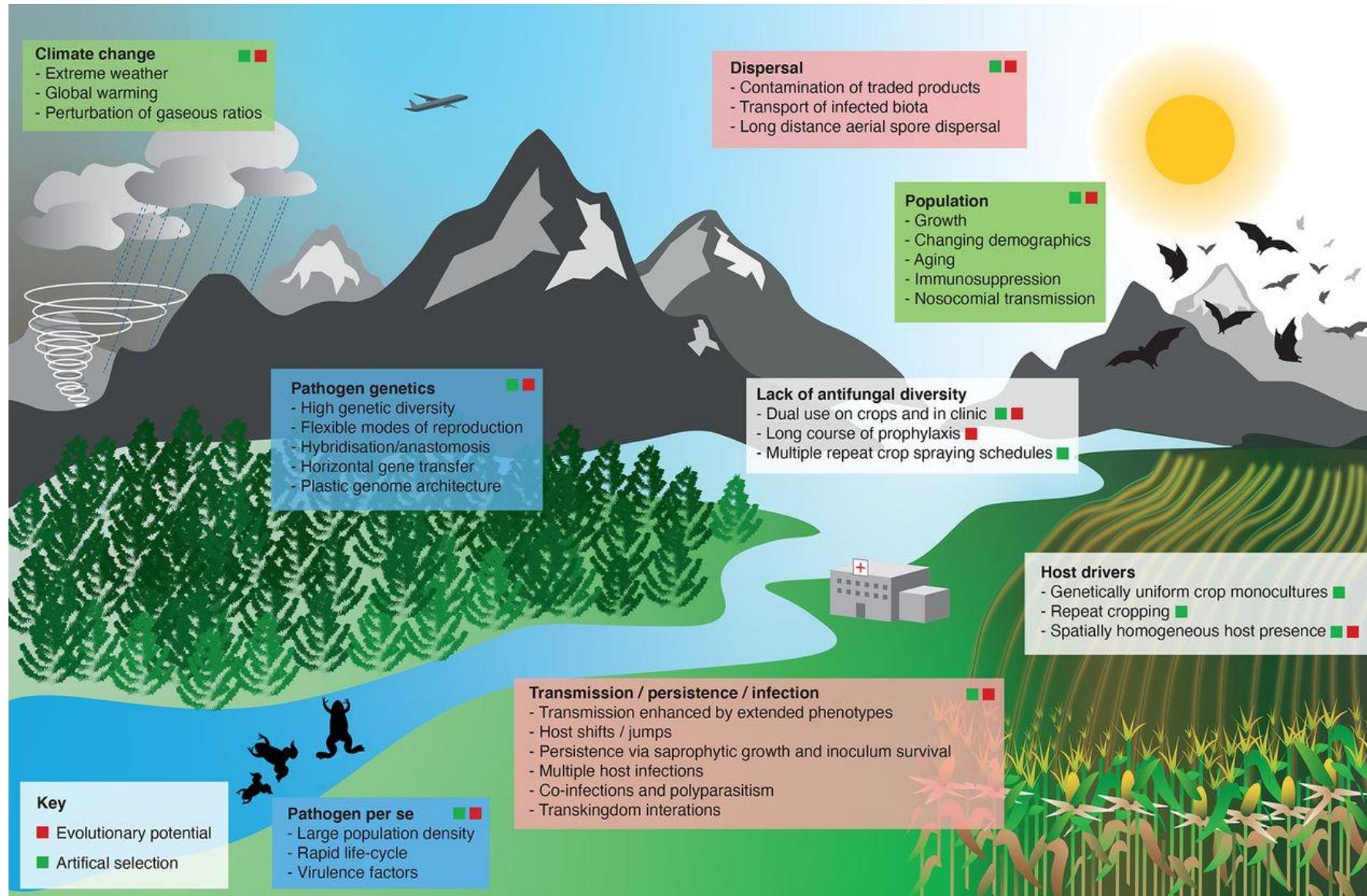
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RESISTANCE HOSPOTS AND FUNGAL THREAT

“The drivers of emerging fungal threats to plants and animals”



Thank you

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