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## Risk of further EHDV introduction in Europe

Amandine Bibard, Davide Martinetti, Albert Picado, Karine Chalvet-Monfray, Thibaud Porphyre

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# RISK OF FURTHER EHDV INTRODUCTION IN EUROPE



**A. Bibard<sup>1</sup>, D. Martinetti<sup>2</sup>, A. Picado<sup>1</sup>, K. Chalvet-Monfray<sup>3</sup>, T. Porphyre<sup>4</sup>**

<sup>1</sup> Boehringer Ingelheim Animal Health, France

<sup>2</sup> UR 0546 Biostatistiques et processus SPatiaux, INRAE

<sup>3</sup> UMR 0346 EPIdémiologie des maladies Animales et zoonotiques, INRAE, VetAgro Sup, France

<sup>4</sup> Laboratoire de Biométrie et Biologie Evolutive, Université Lyon 1, CNRS, VetAgro Sup, France

**Epizootic Hemorrhagic Disease Virus (EHDV)** is a growing threat in Europe for the livestock industry. New incursions are triggered by **wind dispersal** of the *Culicoides* vectors and **trade movements** of live animals.

## How to estimate the Risk of EHDV introduction? A dual-pathway model in 3 steps

**01**

×

**02**

×

**03**

Level of infection at source

Probability to go from source to destination

Secondary cases at destination



EHDV infected  
Zone until Aug  
2024



[2]

[1]



$IR_{\phi, \tau, \psi}$

[1] <https://doi.org/10.1155/2024/5571195>

[2] <https://doi.org/10.1371/journal.pone.0053128>

$\phi$ : spatial unit ( $D$  = country scale);  $\tau$ : temporal unit ( $m$  = month;  $y$  = year);

$\psi$ : pathways considered ( $T$  = Trade only;  $W$  = Wind only;  $TW$  = both Trade and Wind)

# RISK OF FURTHER EHDV INTRODUCTION IN EUROPE

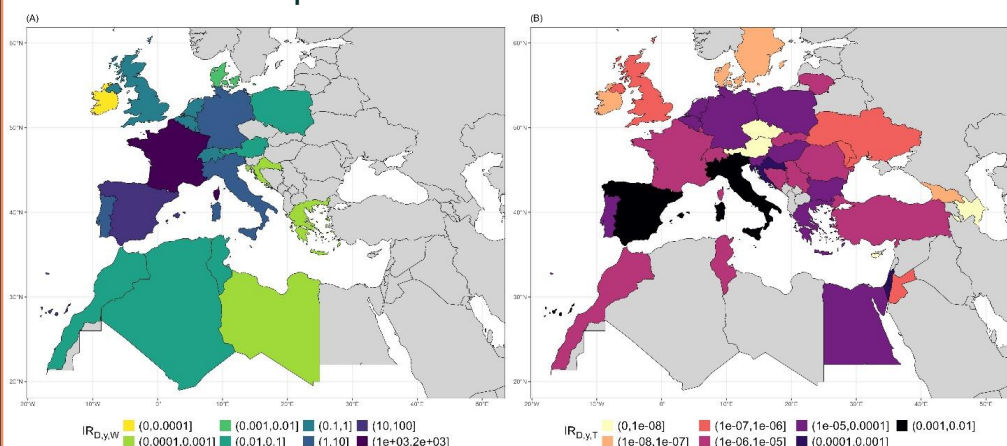


Where ? When ?

## Spatial Distribution of Yearly Risk of EHDV introduction by country

### Wind Dispersal

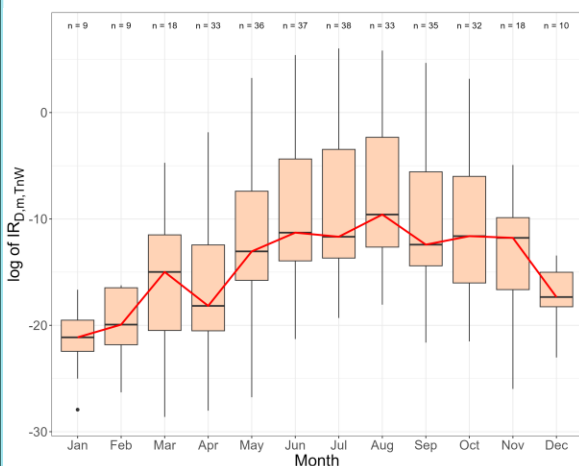
### Trade



- Risk by wind > Risk by trade
- High-risk destinations by the wind = France, Spain & neighbouring countries
- Low or very low risk level by the trade but extended risk zone
- High-risk destinations by trade = Spain, Italy

## Temporal variation of Risk

Cumulative risk per country over the 2 pathways of introduction (in log)



- Period at-risk from June to November
- Animal movements contribute to sustain a baseline level of risk during the colder months, notably in March.

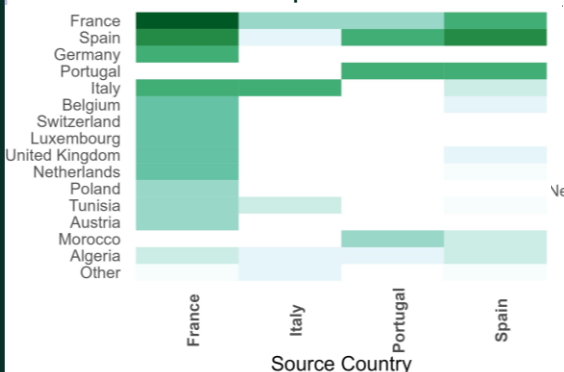
# RISK OF FURTHER EHDV INTRODUCTION IN EUROPE



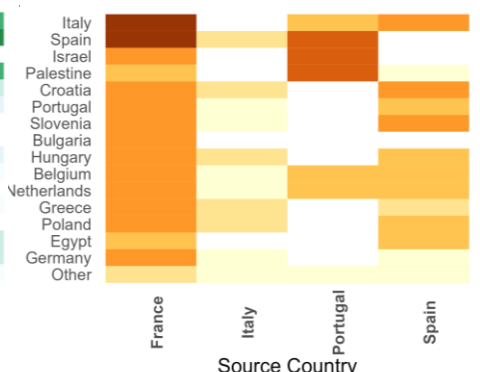
*By which pathway?*

## HeatMap of Risk : source and destination combinations

### Wind Dispersal



### Trade



$IR_{D,y,W}$  (0,0,0.0001] [0.001,0.01] (0.1,1] (10,100] (1e+03,1.2e+03]

$IR_{D,y,T}$  (0,1e-07] (1e-06,1e-05] (0.0001,0.001] (1e-07,1e-06] (1e-05,0.0001] (0.001,0.01]

- France: major contributor of risk for both pathways
- Portugal contributes to risk outside EU (Israel/Palestine) by trade
- Italy: low contributor due to limited initial source zone

## Conclusions

- Risk of EHDV introduction: broad risk area in EU but highly variable risk levels
- Wind: primary risk pathway to nearby countries (France & Spain)
- Trade: Low risk overall, basal risk in distant countries/cool periods
- France: Key risk source for both pathways



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Veterinary epidemiology and economics down under in legs and bounds

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