



HAL
open science

Hepeviridae: les virus de l'hépatite E, un cas d'école du concept One Health

Nicole Pavio

► **To cite this version:**

Nicole Pavio. Hepeviridae: les virus de l'hépatite E, un cas d'école du concept One Health. Licence. Ecole Académique de la formation continue (EAFC), Lycée Michelet, Vanves, France. 2023. hal-04506933

HAL Id: hal-04506933

<https://hal.science/hal-04506933v1>

Submitted on 15 Mar 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - ShareAlike 4.0 International License



Hepeviridae : la famille des virus de l'hépatite E, un cas d'école du concept One Health

Nicole Pavio

Anses Laboratoire de santé animale, UMR VIROLOGIE INRAE, ENVA, Anses, France
nicole.pavio@anses.fr

[Health Topics](#) ▾[Countries](#) ▾[Newsroom](#) ▾[Emergencies](#) ▾[Data](#) ▾[About WHO](#) ▾[Home](#) / [Health topics](#) / [One Health](#)

One health

Overview

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.

While health, food, water, energy and environment are all wider topics with sector-specific concerns, the collaboration across sectors and disciplines contributes to protect health, address health challenges such as the emergence of infectious diseases, antimicrobial resistance, and food safety and promote the health and integrity of our ecosystems.

By linking humans, animals and the environment, One Health can help to address the full spectrum of disease control – from prevention to detection, preparedness, response and management – and contribute to global health security.

[Credits](#) +

Zoonoses

English

العربية

中文

Русский

Español

29 juillet 2020

Principaux faits

- Une zoonose est une maladie ou une infection naturellement transmissible des animaux vertébrés à l'homme.
- Il existe plus de 200 types connus de zoonoses.
- Les zoonoses représentent un pourcentage important des maladies nouvelles et existantes chez l'homme.
- Certaines zoonoses, comme la rage, sont totalement évitables par la vaccination ou par d'autres méthodes.

Une zoonose est une maladie infectieuse qui est passée de l'animal à l'homme. Les agents pathogènes zoonotiques peuvent être d'origine bactérienne, virale ou parasitaire, ou peuvent impliquer des agents non conventionnels et se propager à l'homme par contact direct ou par les aliments, l'eau ou l'environnement. Ils représentent un problème majeur de santé publique dans le monde entier en raison de notre relation étroite avec les animaux dans différents contextes (agriculture, animaux domestique et environnement naturel). Les zoonoses peuvent également perturber la production et le commerce des produits d'origine animale pour l'alimentation ou à d'autres fins.

Les zoonoses représentent une forte proportion de l'ensemble des maladies

Principaux repères



Échinococcose

23 mars 2020



Trématodoses d'origine alimentaire

17 mai 2021



Rage

20 septembre 2023



Taeniasis/Cysticercose

11 janvier 2022



News

Team of experts from ECDC, EFSA, EC and EU Member States conduct visit to Kosovo on One Health approaches against AMR

Between 9 and 13 October 2023, a team of experts will conduct a country visit to Kosovo focusing on Antimicrobial Resistance (AMR) in a 'One Health' perspective.

09 October 2023



News

One Health and vector-borne diseases module

ECDC organises an online training module on One Health and vector-borne diseases 2–4 May and 15–17 May 2023.

17 May 2023



AUTORITÉ
EUROPÉENNE DE
SÉCURITÉ DES
ALIMENTS

FR
Français

Menu

Search news, topics, publications, ev...



[Accueil](#) / [Publications](#) / [The European Union One Health 2021 Zoonoses Report](#)

The European Union One Health 2021 Zoonoses Report

Published: 13 décembre 2022 | **Approved:** 11 novembre 2022

Share:



Index

[Meta data](#)

[Abstract](#)

[Dossier\(s\) connexe\(s\)](#)





ANNUALLY ON 3 NOVEMBER

Home About Events Promotional Student competition Contact



About One Health Day

One Health Day is an international campaign co-ordinated by the [One Health Commission](#), the [One Health Initiative](#) Autonomous *pro bono* Team and the One Health Platform Foundation. The goal of One Health Day is to bring attention around the world to the need for One Health interactions and for the world to 'see them in action'.

For more information about One Health Day, [visit here](#) or [email your Regional Contact](#).

Google

Raccourcis clavier Données cartographiques ©2023 Conditions d'utilisation

Présentation

[Accueil](#) > Présentation

Présentation



Le DIM 1HEALTH se fonde sur la triade santé environnementale, santé humaine et santé animale, domaines indissociables compte tenu de leurs étroites interactions. Le concept « une seule santé » a en effet émergé dans un contexte de changement climatique, de croissance démographique à l'échelle mondiale, de raréfaction des ressources naturelles, de pression sanitaire mouvante, dans la population humaine comme dans les populations animales.

Ce projet scientifique cible les actions impliquées dans la chaîne « dépistage-surveillance-traitement-prévention-prédiction », tout en prenant en compte la demande sociétale. Il vise à croiser les recherches entre acteurs d'institutions différentes, et à conduire à des améliorations

UMR Virologie INRAE-ANSES-ENVA



Campus ENVA – ANSES, Maisons-Alfort, Val-de-Marne



« OneWorld, OneHealth »

Agents infectieux

zoonotiques ou émergents à haut potentiel épidémique

Référence & Recherche

Santé animale

Santé humaine

Méthodes de détection
Surveillance, Epidémiologie
Phylogénie

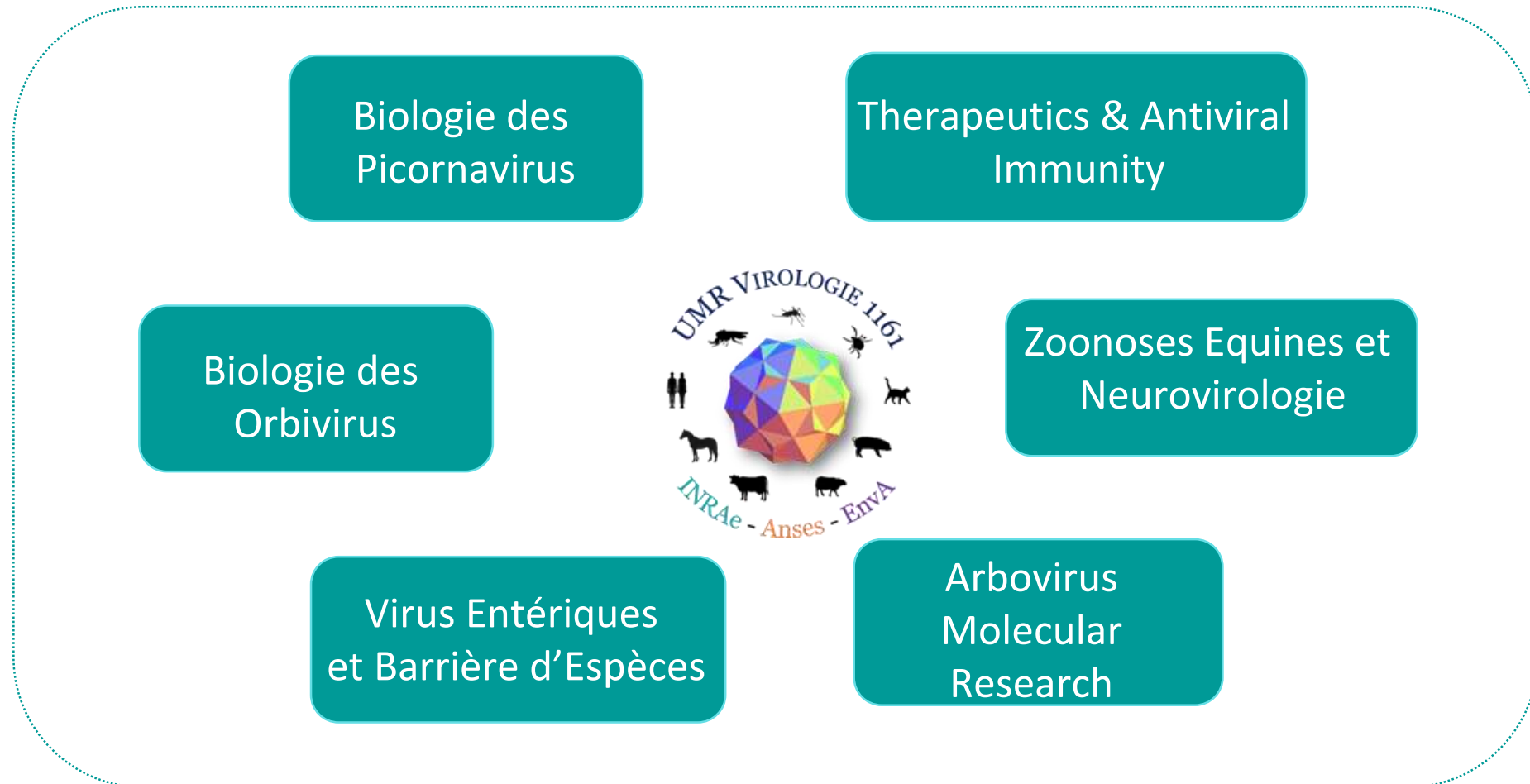
Nouvelles approches
vaccinales et thérapies
anti-infectieuses

Physiopathologie,
Interactions hôtes-virus
Barrière inter-espèces



➤ UMR Virologie

Maladies virales épizootiques et zoonotiques, émergentes et réémergentes



HEPATITIS E VIRUS

NO.6 SPILLOVER RISK OUT OF 889 VIRUSES

[NOT SEEING THE VIRUS YOU'RE LOOKING FOR?](#)



RISK SCORE
(OUT OF 155)

CONTRIBUTIONS TO RISK SCORE



HOST



ENVIRONMENT



VIRUS



SEARCH BY:

Virus Name

ORDER BY:

Overall Rank

SHOW KNOWN ZONOTICS:

Show all viruses

FILTER BY:

Virus Family

Virus Genus

Virus Species

Country

Host Order

Host Species

RISK POSITION	RISK SCORE	VIRUS	GENUS	FAMILY
1	97	Severe acute respiratory syndrome coronavirus 2	Betacoronavirus	Coronaviridae
2	91	Lassa virus	Mammarenavirus	Arenaviridae
3	87	Ebola virus	Ebolavirus	Filoviridae
4	86	Seoul virus	Hantavirus	Bunyaviridae
5	86	Nipah virus	Henipavirus	Paramyxoviridae

NO.6

SPILLOVER RISK

OUT OF 889 VIRUSES



RISK SCORE
(OUT OF 155)

VIRUS

Hepatitis E virus

SPECIES

Orthohepevirus A

DETAILS

Distribution in Animals: **Global**
Zoonotic Virus: **Yes**
Human-to-Human: **Yes**

GENUS

Orthohepevirus

HOST

Distribution: **Global**
Plasticity: **17 species, 6 orders**

FAMILY

Hepeviridae

GENERAL

Data Available for: **31 out of 31**
Risk Factors

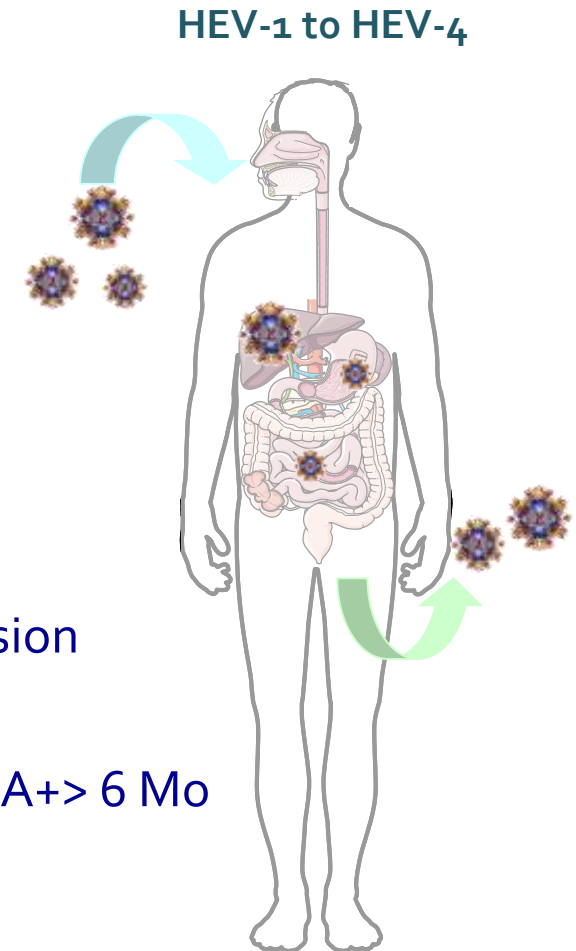
Number of Records: **243**

[FULL DETAILS](#)

Hepatitis E virus infection in human



Every year : 20 million hepatitis E infections
 3 million symptomatic cases
 56 600 hepatitis E-related deaths.



- ★ Liver enzyme X 10
- ★ Anti-HEV IgM +
- ★ HEV RNA +

- **Incubation time** 40 days (2-9 weeks)
- **Acute Hepatitis** Enteric transmission (similar to hepatitis A), blood transfusion
- **Fulminate Hepatitis** 1%-4%. Pregnant women: 15%-25%
- **Chronic Hepatitis** Immuno-suppression (solid organ transplant recipient) RNA+ > 6 Mo
- **Neurologic syndroms** Guillain-Barré, Parsonage-Turner (CSF+ chronic infection)
- **Extra-hepatic** Kidney dysfunction, pancreatitis
- **Hepatocellular carcinoma** (Amougou Atsama, 2017; Borentain P et al 2017)

Hepatitis E epidemiology

Endemic Regions: large epidemics

Tropical, subtropical

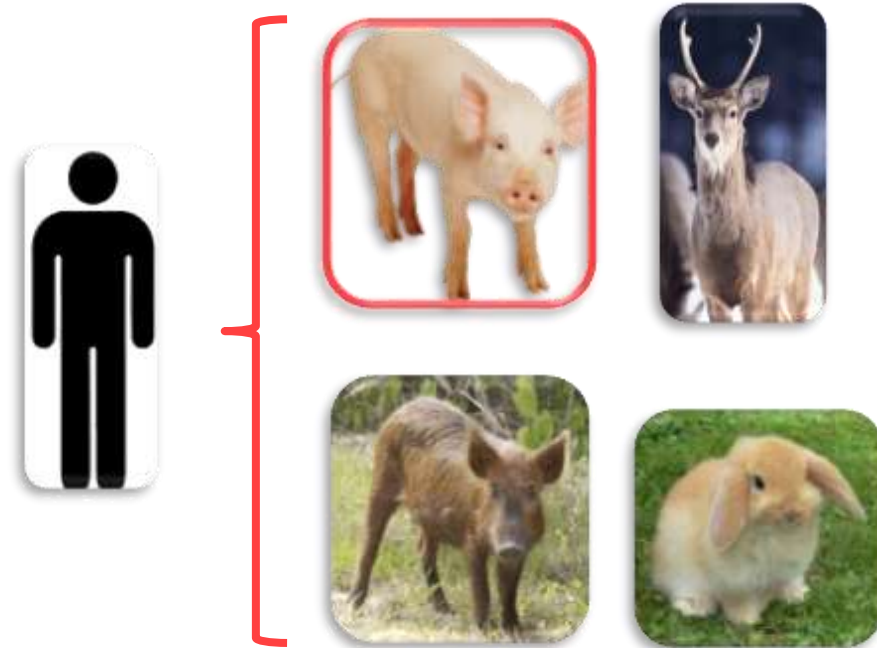
Water, spoiled foods



HEV-1, HEV-2

Autochthonous sporadic or small outbreaks: ZONOSIS Europe, Japan, USA

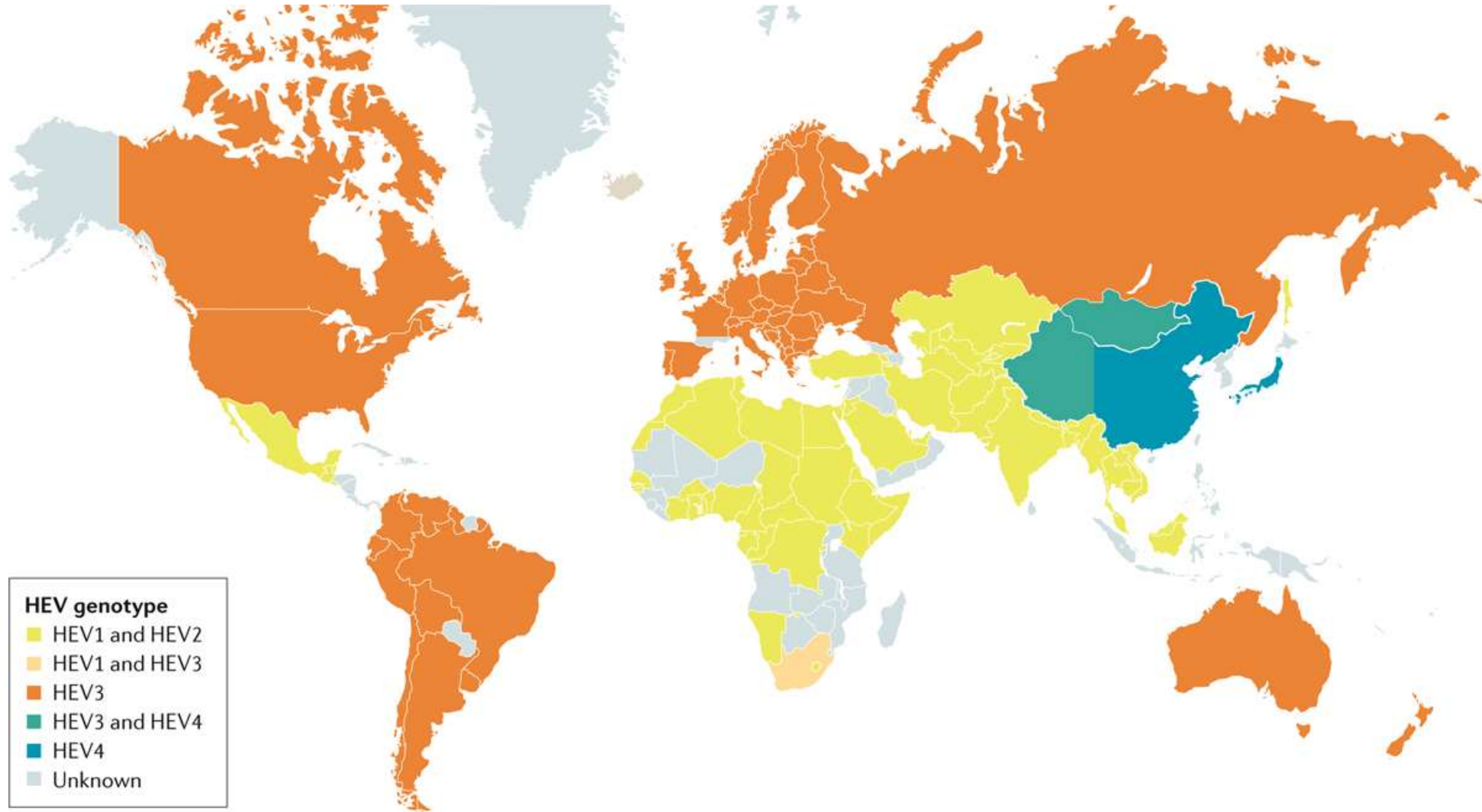
Undercooked meat, contact



HEV-3, HEV-4

Worldwide presence of HEV

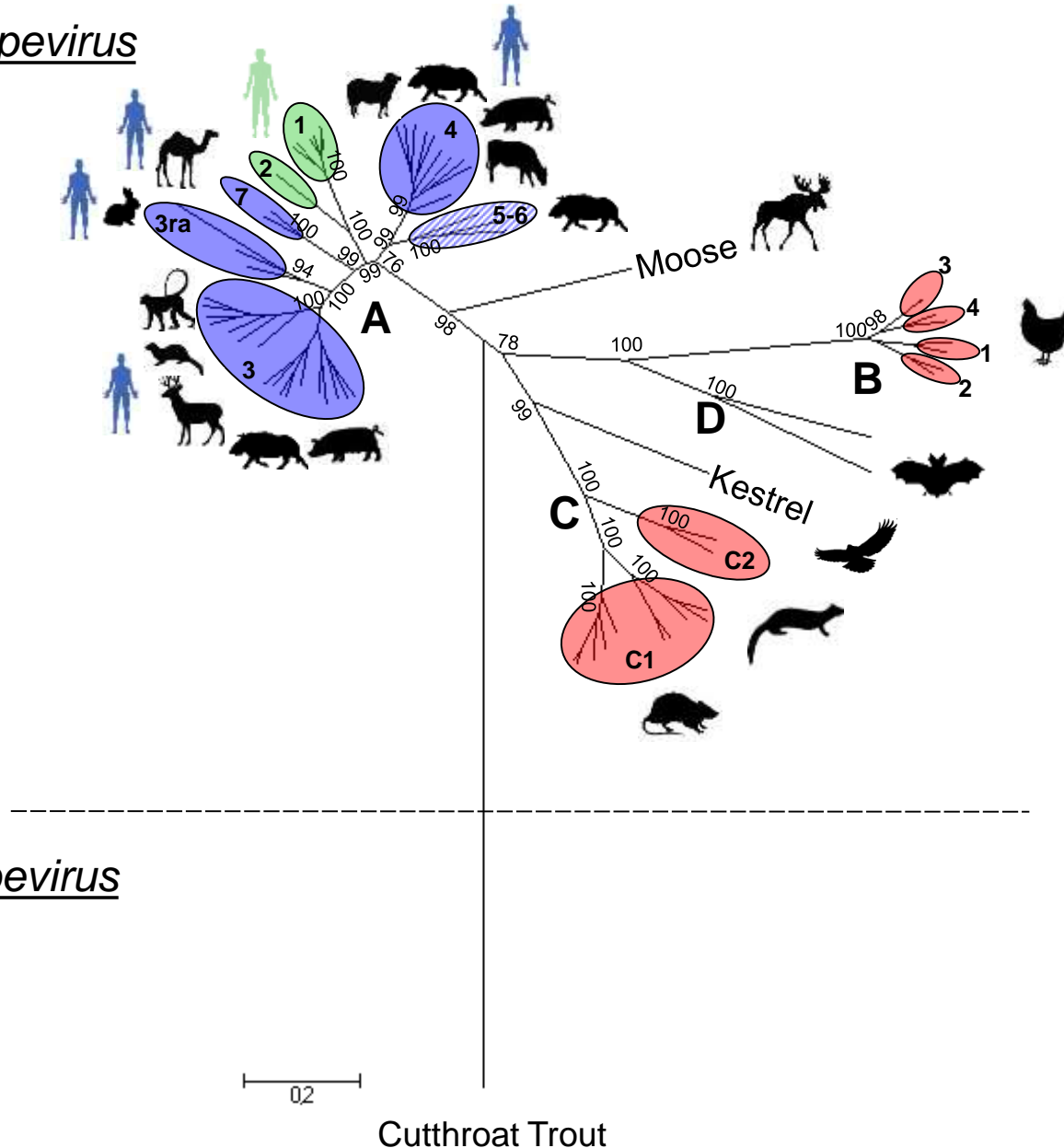
Kamar, N. *et al.* (2017) Hepatitis E virus infection *Nat. Rev. Dis. Primers* doi:10.1038/nrdp.2017.86



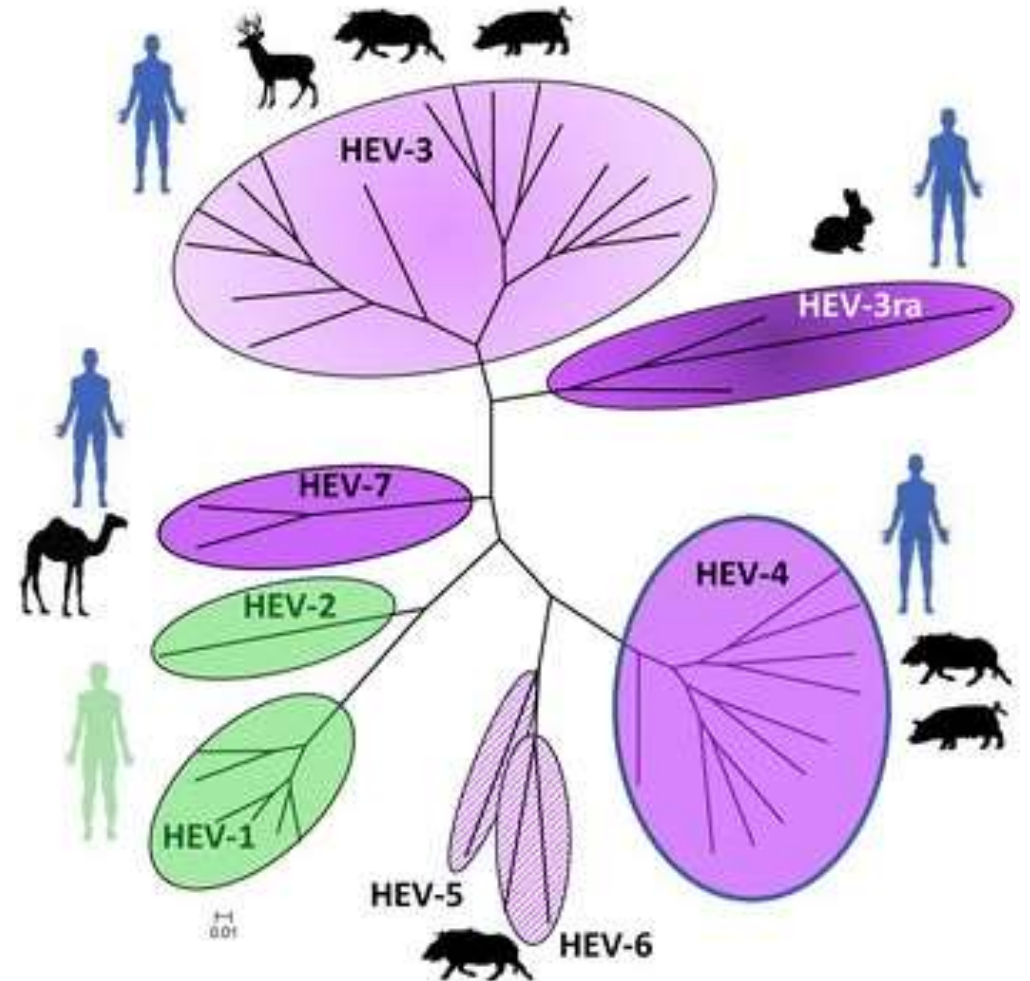
Nature Reviews | Disease Primers

Hepeviridae Family

Orthohepevirus



Paslahepevirus

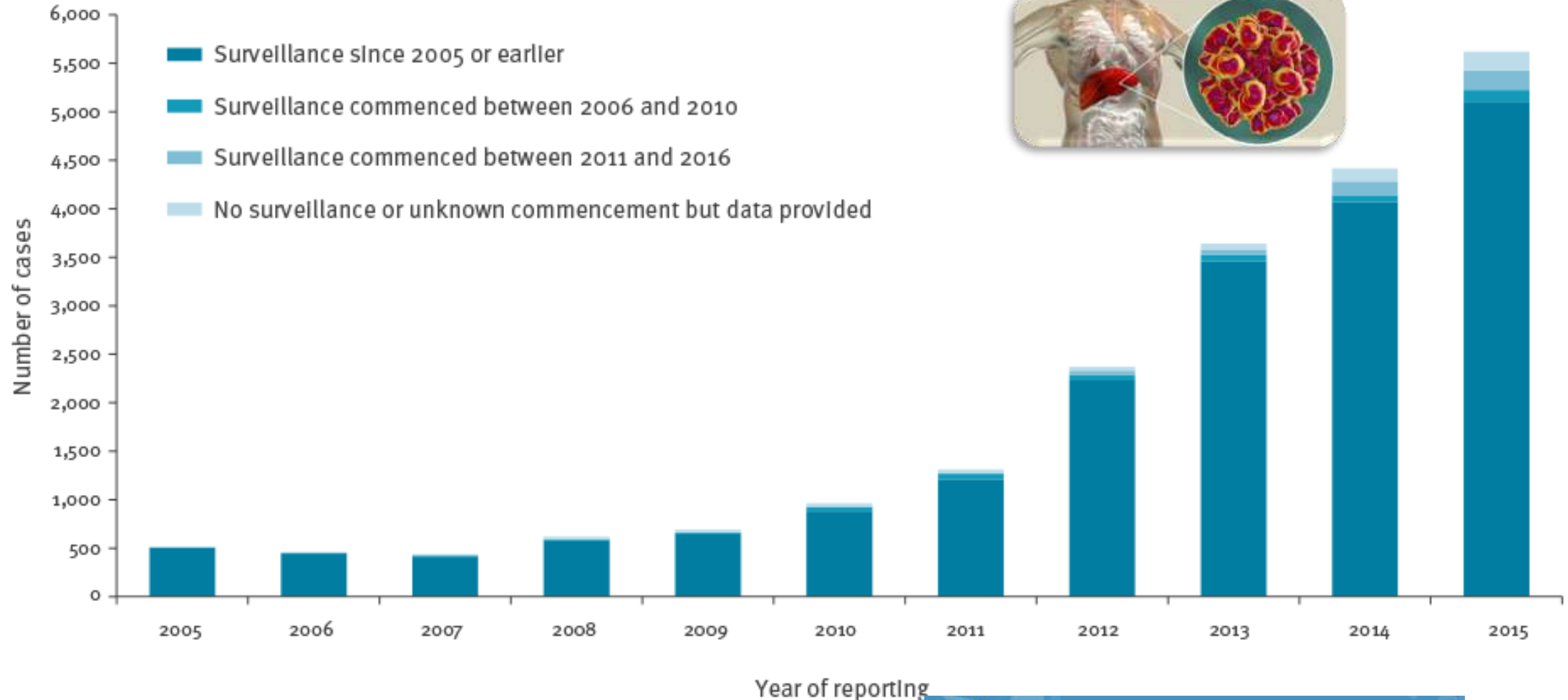
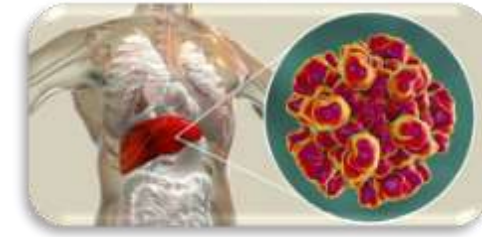


Piscihepevirus

Cutthroat Trout

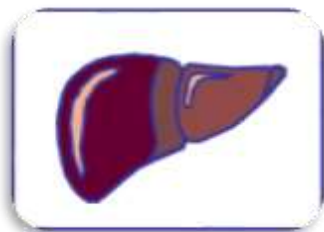
HEV EPIDEMIOLOGY IN HUMANS

Reported number of cases of hepatitis E virus infection by year of notification and year of surveillance commencement, 22 European Union/European Economic Area (EU/EEA) countries, 2005–2015



Sources/vehicules of HEV-3 and HEV-4: infected meat/food products

✓ Pork Liver contaminated with HEV : grocery stores, slaughterhouse



Europe, North America, Japan: 1.9% to **12,7%**

✓ Pork liver sausages contaminated with HEV

France (<i>Pavio et al 2014</i>)	30% (confirmed cases HEV-3)
Germany (<i>Szabo et al et al 2015</i>)	22%
Italy (<i>Di Bartolo et al 2014</i>)	24%
Switzerland (<i>Moor et al 2018</i>)	19%
The Netherland (<i>Boxman, et al 2019</i>)	70%



✓ Pork sausages

UK (<i>Berto et al 2012</i>)	10%
Germany (<i>Szabo et al 2015</i>)	20%
Switzerland (<i>Moor et al 2018</i>)	6%

Sources/vehicules of HEV-3 and HEV-4: contact/environment

★ Swine Slurry

★ Slaughterhouse

- ❖ Personnel (hands), surfaces, ustensiles (knife, hook), effluents, transportation vehicles



★ Waste Water Treatment Plant (Europe)



★ Surface water in non endemic region (The Netherlands)

★ Shell fish

- ❖ Corbicula Japonica, Japan
- ❖ Outbreak on Cruise Ship (Oyster HEV-3)
- ❖ Mussels up to 92% HEV RNA (UK)
- ❖ Bioaccumulation in Oyster

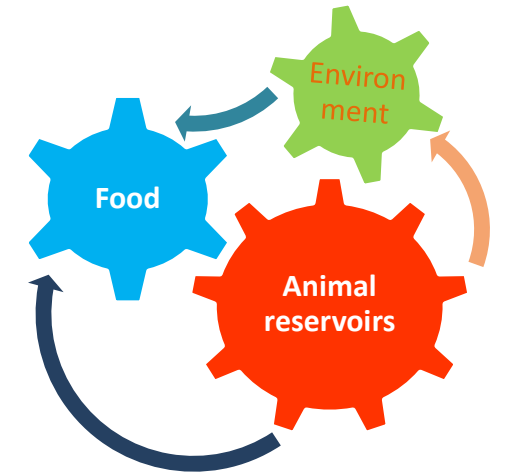


★ Soft fruits (strawberries and other berries)



★ Green leafy salads

★ Herb and Spices



HEV in French pig population



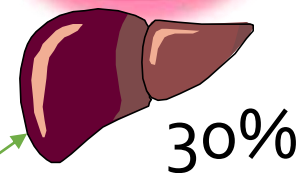
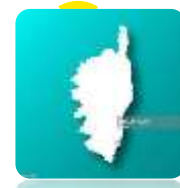
3 mois



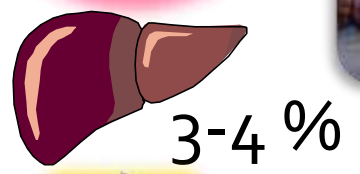
6 mois



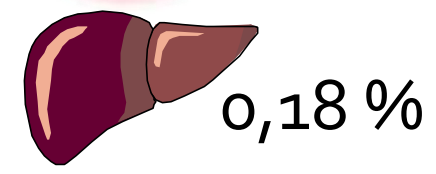
> 12 mois



Pellerin et al 2022



Rose et al 2011, Bouquet et al 2011, Pavio et al 2014



Pellerin et al 2022

HEV strains in French in pig population

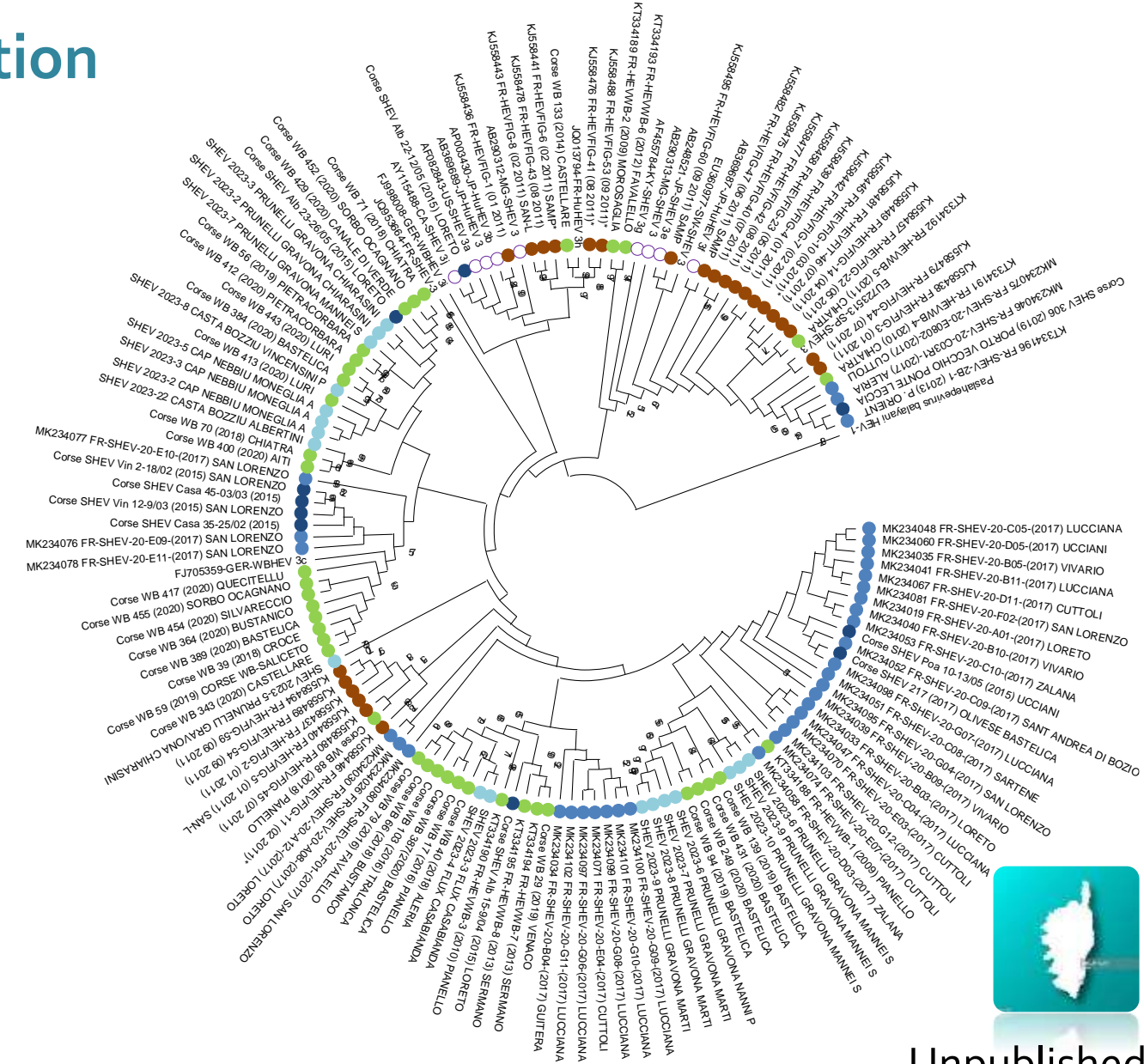


Sous-types	3c % (n)	3e % (n)	3f % (n)	non défini % (n)	Total n
Séquences humaines	15.1 (16)	4.7 (5)	72.6 (77)	7.6 (8)	106
Séquences porcines	9.3 (4)	4.7 (2)	76.7 (33)	9.3 (4)	43
Total	13.4 (20)	4.7 (7)	73.8 (110)	8.1 (12)	149



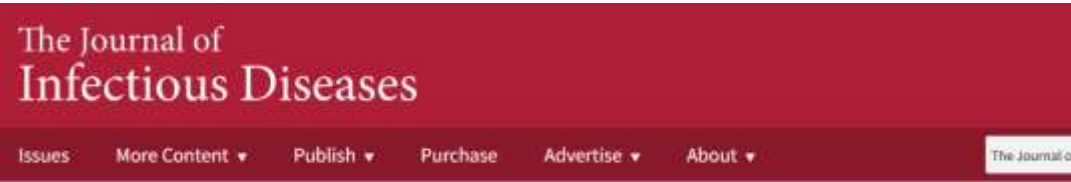
Majorité 3c > 3f > 3h (2009-2023)

Bouquet et al 2011



Unpublished

Rocahepevirus ratti (HEV-C1) :



Volume 220, Issue 6
15 September 2019

JOURNAL ARTICLE

Rat Hepatitis E Virus Linked to Severe Acute Hepatitis in an Immunocompetent Patient

Anton Andonov, Mark Robbins, Jamie Borlang, Jingxin Cao, Todd Hatchette, Ashley Stueck, Yvon Deschambault, Kyle Murnaghan, Jessy Varga, Lynn Johnston

The Journal of Infectious Diseases, Volume 220, Issue 6, 15 September 2019, Pages 951–955, <https://doi.org/10.1093/infdis/jiz025>

Published: 14 January 2019 [Article history](#)



Articles Publish Topics About Contact

LETTER TO THE EDITOR | VOLUME 79, ISSUE 1, E39-E41, JULY 2023

Download Full Issue

PDF [216 KB]

Orthohepevirus C hepatitis, an underdiagnosed disease?

Christophe Rodriguez, Sarah Marchand, Anna Sessa, Pierre Cappy, Jean-Michel Pawlotsky

Published: February 17, 2023 • DOI: <https://doi.org/10.1016/j.jhep.2023.02.008> • [Check for updates](#)

frontiers
in Medicine

BRIEF RESEARCH REPORT
published: 03 September 2021
doi: 10.3389/fmed.2021.726363



Rat Hepatitis E Virus: Presence in Humans in South-Western France?

Delphine Parraud¹, Sébastien Lhomme^{1,2}, Jean Marie Péron³, Isabelle Da Silva¹, Suzanne Tavitian⁴, Nassim Kamar⁵, Jacques Izopet^{1,2} and Florence Abravanel^{1,2*}

Next : investigate the zoonotic potential of *Rocahepevirus ratti et eothenomi*


















Science of The Total Environment

Volume 896, 20 October 2023, 165069



Increased rat-borne zoonotic disease hazard in greener urban areas

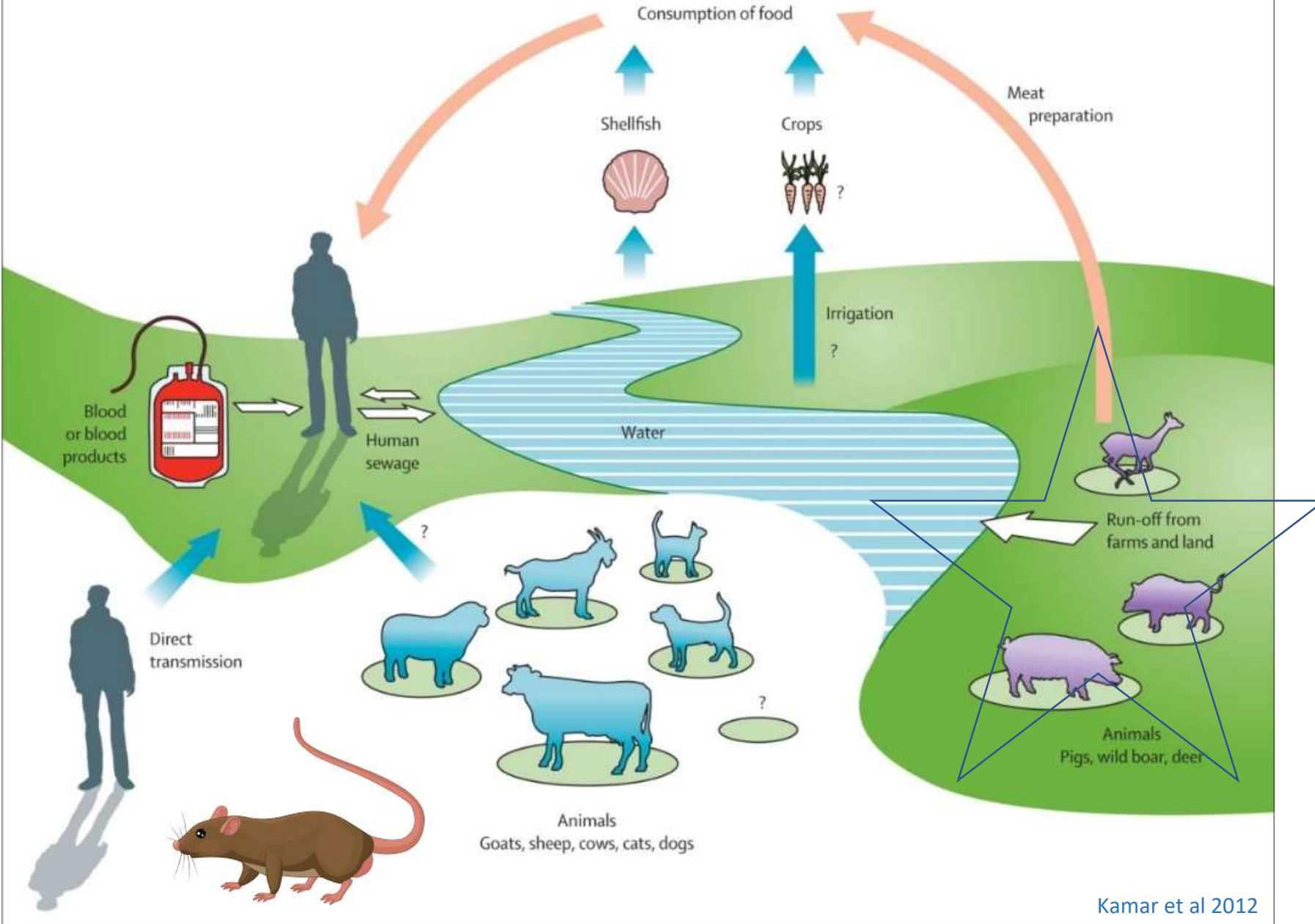
[Marieke P. de Cock](#)^{a,b}  , [Ankje de Vries](#)^a , [Manoj Fonville](#)^a , [Helen J. Esser](#)^c ,
[Calvin Mehl](#)^{d,e} , [Rainer G. Ulrich](#)^{d,e} , [Maike Joeres](#)^f , [Donata Hoffmann](#)^g ,
[Tobias Eisenberg](#)^h , [Katja Schmidt](#)ⁱ , [Marcel Hulst](#)^j , [Wim H.M. van der Poel](#)^{b,j} ,
[Hein Sprong](#)^a , [Miriam Maas](#)^a 



75 % foodborne origin of HEV

Van Cauteren et al, 2018

25% ?????



MERCI