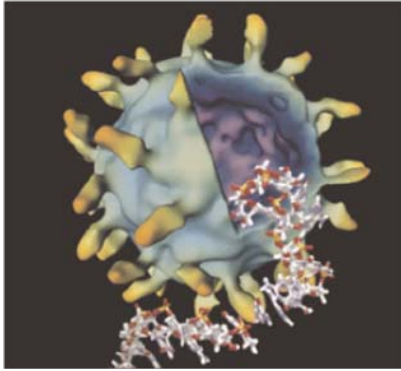


# Hépatite E & transplantation d'organes

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**Genotype 3 HEV infection is an emerging disease in developing countries**

*The NEW ENGLAND JOURNAL of MEDICINE*

## Hepatitis E Virus and Chronic Hepatitis in Organ-Transplant Recipients

Nassim Kamar, M.D., Ph.D., Janick Selves, M.D., Jean-Michel Mansuy, M.D., Leila Ouezzani, M.D., Jean-Marie Péron, M.D., Ph.D., Joëlle Guitard, M.D., Olivier Cointault, M.D., Laure Esposito, M.D., Florence Abravanel, Pharm.D., Marie Danjoux, M.D., Dominique Durand, M.D., Jean-Pierre Vinel, M.D., Jacques Izopet, Pharm.D., Ph.D., and Lionel Rostaing, M.D., Ph.D.

N ENGL J MED 358;8 WWW.NEJM.ORG FEBRUARY 21, 2008

## Chronic Hepatitis E with Cirrhosis in a Kidney-Transplant Recipient

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ORIGINAL ARTICLE

## Hepatitis E Virus Infection as a Cause of Graft Hepatitis in Liver Transplant Recipients

## Factors Associated With Chronic Hepatitis in Patients With Hepatitis E Virus Infection Who Have Received Solid Organ Transplants

NASSIM KAMAR,<sup>\*,†,§</sup> CYRIL GARROUSTE,<sup>\*,||</sup> ELIZABETH B. HAAGSMA,<sup>||</sup> VALÉRIE GARRIGUE,<sup>#</sup> SVEN PISCHKE,<sup>\*\*</sup> CÉCILE CHAUVET,<sup>††</sup> JÉROME DUMORTIER,<sup>§§</sup> AMÉLIE CANNESON,<sup>|||</sup> ELISABETH CASSUTO-VIGUIER,<sup>|||</sup> ERIC THERVET,<sup>###</sup> FILOMENA CONTI,<sup>\*\*\*</sup> PASCAL LEBRAY,<sup>†††</sup> HARRY R. DALTON,<sup>§§§</sup> ROBERT SANTELLA,<sup>|||</sup> NADA KANAAN,<sup>|||</sup> MARIE ESSIG,<sup>###</sup> CHRISTIANE MOUSSON,<sup>\*\*\*\*</sup> SYLVIE RADENNE,<sup>††††</sup> ANNE MARIE ROQUE-AFONSO,<sup>§§§§</sup> JACQUES IZOPET,<sup>†,§,||</sup> and LIONEL ROSTAING<sup>\*,†,§</sup>

Benjamin Baechlein,<sup>5</sup> Hannelore Barg-Hock,<sup>2</sup> Christian P. Strassburg,<sup>1</sup> Frank Lehner,<sup>2</sup> Markus Cornberg,<sup>1</sup> Frauke Seehusen,<sup>6</sup> Jacques Izopet,<sup>9,10</sup> Michael P. Manns,<sup>1</sup>

## Chronic Hepatitis E Virus Infection in Liver Transplant Recipients

Elizabeth B. Haagsma,<sup>1</sup> Arie P. van den Berg,<sup>1</sup> Robert J. Porte,<sup>2</sup> Cornelis A. Benne,<sup>3</sup> Harry Vennema,<sup>4</sup> Johan H. J. Reimerink,<sup>4</sup> and Marion P. G. Koopmans<sup>4</sup>

## Hepatitis E Virus-Related Cirrhosis in Kidney- and Kidney–Pancreas-Transplant Recipients

N. Kamar<sup>a,b,\*</sup>, J.-M. Mansuy<sup>c</sup>, O. Cointault<sup>a</sup>, J. Selves<sup>d</sup>, F. Abravanel<sup>c,e</sup>, M. Danjoux<sup>d</sup>, P. Otal<sup>f</sup>, L. Esposito<sup>a</sup>, D. Durand<sup>a</sup>, J. Izopet<sup>c,e</sup> and L. Rostaing<sup>a,e</sup>

*Influence of Immunosuppressive Therapy on the Natural History of Genotype 3 Hepatitis-E Virus Infection After Organ Transplantation*  
Nassim Kamar,<sup>1,2,§</sup> Florence Abravanel,<sup>3,4</sup> Janick Selves,<sup>5</sup> Cyril Garrouste,<sup>1</sup> Laure Esposito,<sup>1</sup> Laurence Lavayssière,<sup>1</sup> Olivier Cointault,<sup>1</sup> David Ribes,<sup>1</sup> Isabelle Cardiau,<sup>1</sup> Marie Béatrice Nogier,<sup>1</sup> Jean Michel Mansuy,<sup>3,4</sup> Fabrice Muscarel,<sup>6</sup> Jean Marie Peron,<sup>7</sup> Jacques Izopet,<sup>3,4</sup> and Lionel Rostaing<sup>4,8</sup>

# Chronic Hepatitis E with Cirrhosis in a Kidney-Transplant Recipient

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ORIGINAL

*The NEW ENGLAND JOURNAL of MEDICINE*

## Factors Associated With Chronic Hepatitis E Virus Infection in Kidney Transplant Recipients With Hepatitis B Virus Infection

NASSIM KAMAR,<sup>\*,†</sup> ROUSTE...  
CÉCILE CHAUVET,<sup>‡</sup> DUMOF...  
ERIC THERVENET,<sup>§</sup> CONT...  
NADA KAMAR,<sup>¶</sup> ESSIG...  
ANNE MARIE... FONSC...

## Chronic Transplantation of Hepatitis E Virus Infection in Liver

Elizabeth Johar... J. Porte,<sup>2</sup> Cornelis A. Benne,<sup>3</sup> Harry Vennema,<sup>4</sup>

## Chronic Hepatitis E Virus-Related Cirrhosis in Kidney-Pancreas-Transplant Recipients

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and L. Rostaing<sup>a,e</sup>

Hepatitis E in an HIV-infected patient  
Philippe Colson<sup>a,b,\*</sup>, Mamadou Kaba<sup>a,b</sup>, Jacques Moreau<sup>c</sup>, Philippe Brouqui<sup>b,c</sup>

Influence of Immunosuppressive Therapy on the Natural History of Genotype 3 Hepatitis-E Virus Infection After Organ Transplantation  
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# Reactivation of hepatitis E infection in a patient with acute lymphoblastic leukaemia after allogeneic stem cell transplantation

P le Coutre,<sup>1</sup> H Meisel,<sup>2</sup> J Hofmann,<sup>2</sup> C Röcken,<sup>3</sup> G L Vuong,<sup>1</sup> S Neuburger,<sup>1</sup>  
P G Hemmati,<sup>1</sup> B Dörken,<sup>1</sup> R Arnold<sup>1</sup>

## Chronic Hepatitis After Hepatitis E Virus Infection in a Patient With Non-Hodgkin Lymphoma Taking Rituximab

Laurence Ollier, MD  
Nathalie Tieulie, MD  
Frédéric Sanderson, MD  
Philippe Heudier, MD  
Valérie Giordanengo, MD, PhD  
Jean-Gabriel Fuzibet, MD, PhD

## Chronic Hepatitis E Virus Infection: Successful Virologic Response to Pegylated Interferon- $\alpha$ Therapy

Laurent Alric, MD, PhD  
Delphine Bonnet, MD  
Guy Laurent, MD, PhD  
Nassim Kamar, MD, PhD  
Jacques Izopet, PharmD, PhD

## Prolonged hepatitis E in an immunocompromised patient

Jean-Marie Péron,\* Jean-Michel Mansuy,<sup>1</sup> Christian Récher,<sup>1</sup>  
Christophe Bureau,\* Hélène Poirson,\* Laurent Alric,<sup>3</sup>  
Jacques Izopet<sup>1</sup> and Jean-Pierre Vinel\*

# Persistent infection of hepatitis E virus transmitted by blood transfusion in a patient with T-cell lymphoma

Akinori Tamura,<sup>1</sup> Yohko K. Shimizu,<sup>2</sup> Torahiko Tanaka,<sup>3</sup> Kazumichi Kuroda,<sup>2</sup>  
Yasuyuki Arakawa,<sup>1</sup> Kazuaki Takahashi,<sup>4</sup> Shunji Mishiro,<sup>4</sup> Kazufumi Shimizu<sup>2</sup>  
and Mitsuhiro Moriyama<sup>1</sup>

# Definition of chronic HEV infection

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- ❖ There is no established definition for chronic HEV infection
- ❖ Definition used in published literature:

Persisting elevated liver-enzyme levels

&

Positive HEV RNA in the serum and/or in the stools

6 months after diagnosis

# HEV Seroprevalence in organ donors (Toulouse)

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- ❖ Between 2004 and 2008, organ donors were tested for anti-HEV IgG: ( $N= 258$ )
- ❖ 35/258 were tested positive for anti-HEV IgG
- ❖ 15/258 were tested positive for anti-HEV IgM (HEV RNA negative)

⇒ **Seroprevalence in organ donors = 13.5%**

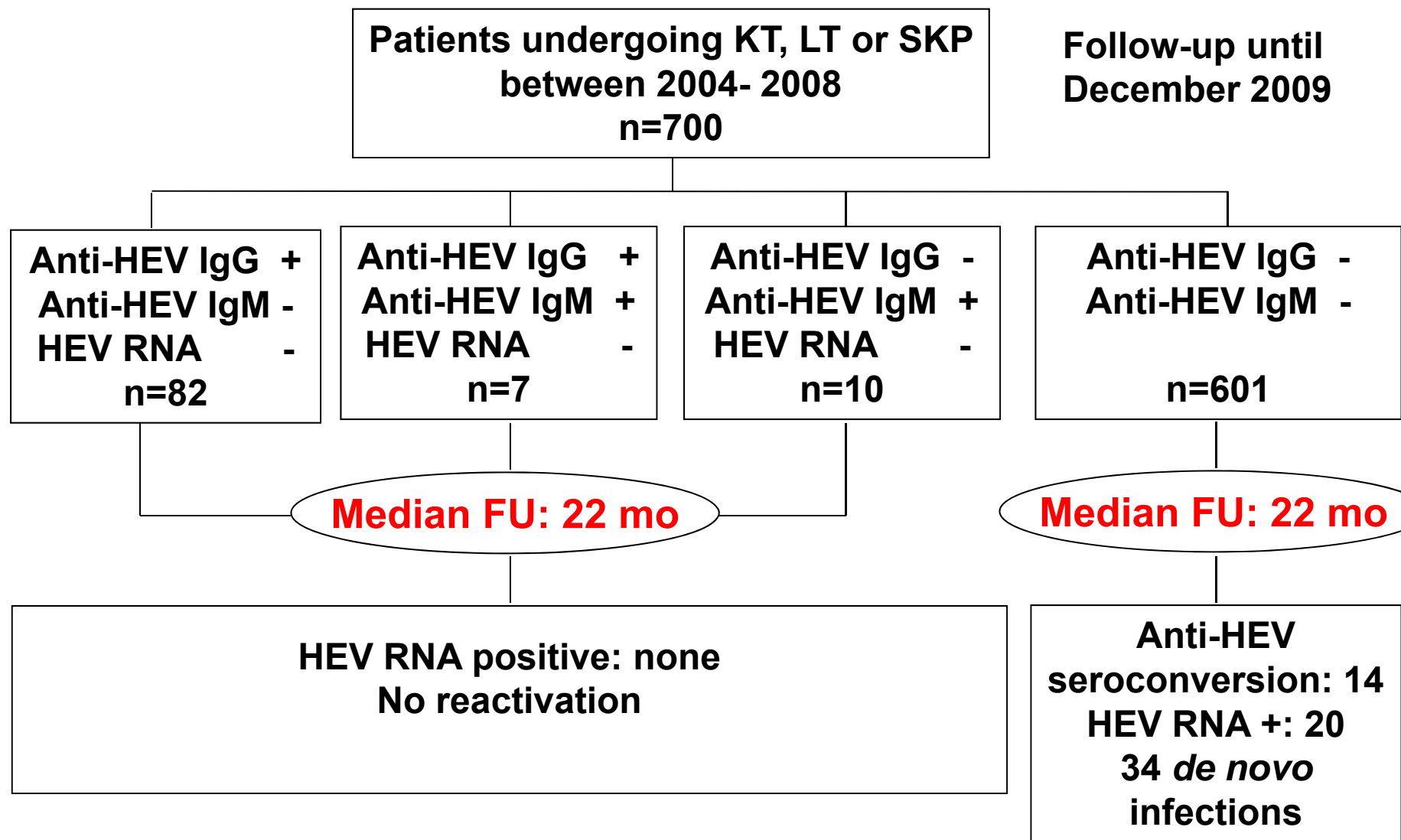
# No HEV transmission by the graft or by blood transfusion

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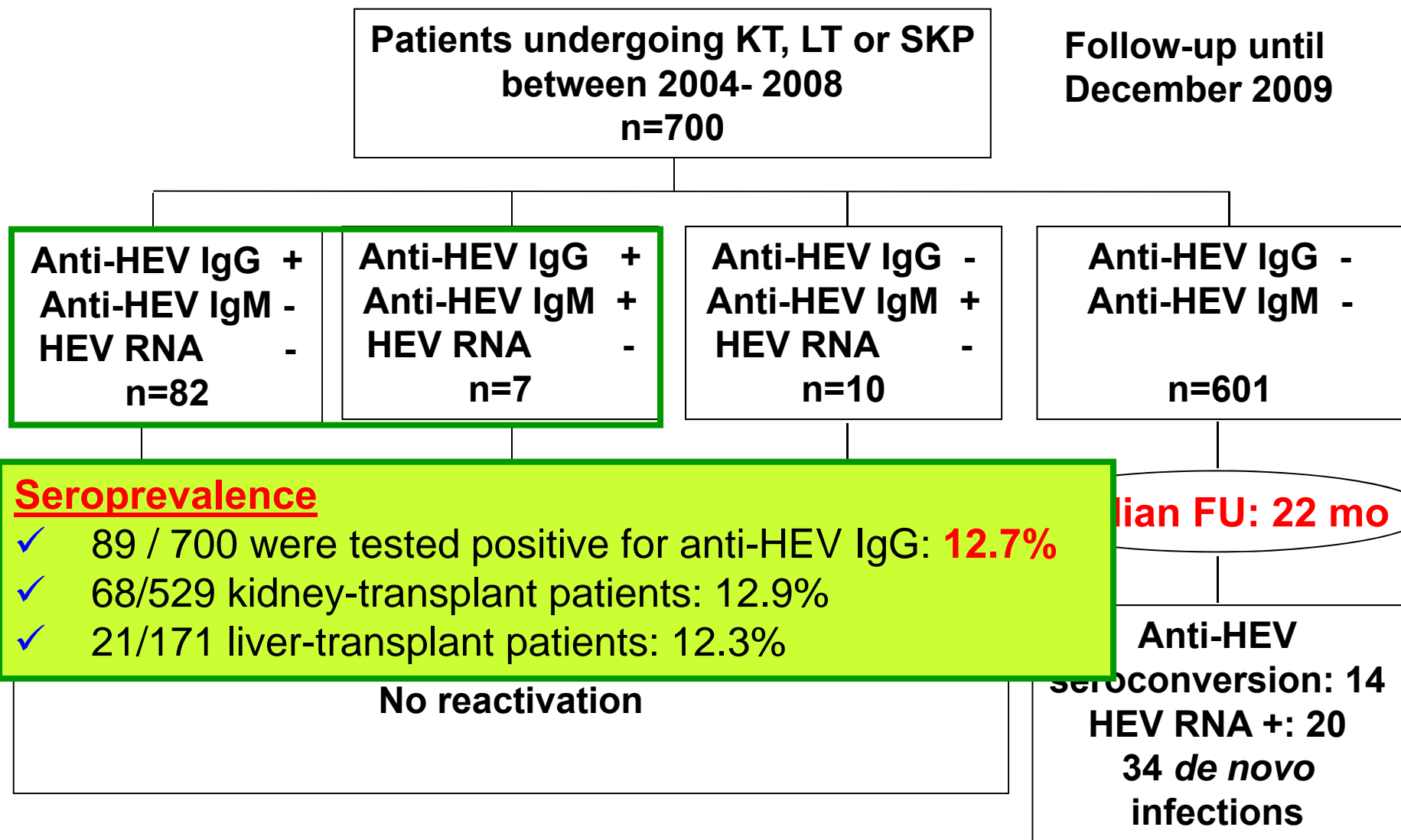
- ❖ Organ donors of 15/17 SOT who presented with HEV infection within the first year posttransplantation were tested for HEV:
  - ✓ 14 were anti-HEV IgG - / Ig M -
  - ✓ 1 was anti-HEV IgG - / Ig M + (HEV RNA -)
- ❖ Among 34 SOT with HEV infection, 2 had receive blood transfusion within the 3 months before acute HEV episode. The 10 involved blood donors were tested for HEV:
  - ✓ 9 were anti-HEV IgG - / Ig M -
  - ✓ 1 was anti-HEV IgG - / Ig M +
  - ✓ All 10 were HEV RNA -



# HEV Seroprevalence and incidence in SOT patients (Toulouse)



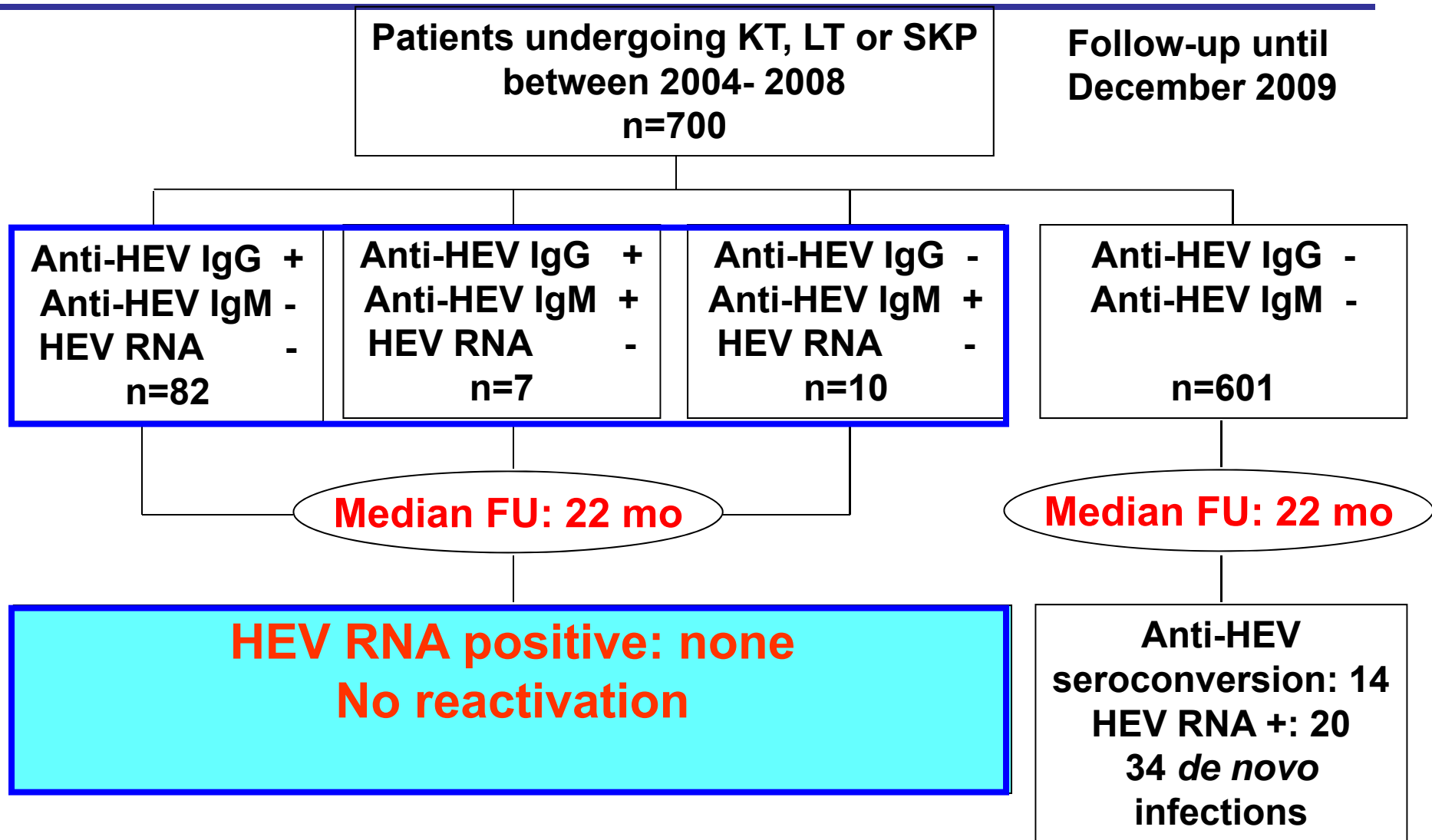
# HEV Seroprevalence and incidence in SOT patients (Toulouse)



**Seroprevalence**

- ✓ 89 / 700 were tested positive for anti-HEV IgG: **12.7%**
- ✓ 68/529 kidney-transplant patients: 12.9%
- ✓ 21/171 liver-transplant patients: 12.3%

# HEV Seroprevalence and incidence in SOT patients (Toulouse)



# HEV Seroprevalence and incidence in SOT patients (Toulouse)

Patients undergoing KT, LT or SKP  
between 2004- 2008  
n=700

Follow-up until  
December 2009

**Incidence:**

- ✓ Overall: 3.2 cases/100 person-years
- ✓ Kidney-transplant : 2.7 cases/100 person-years
- ✓ Liver-transplant : 4.8 cases/100 person-years

**P=0.09**

Anti-HEV IgG -  
Anti-HEV IgM -  
  
n=601

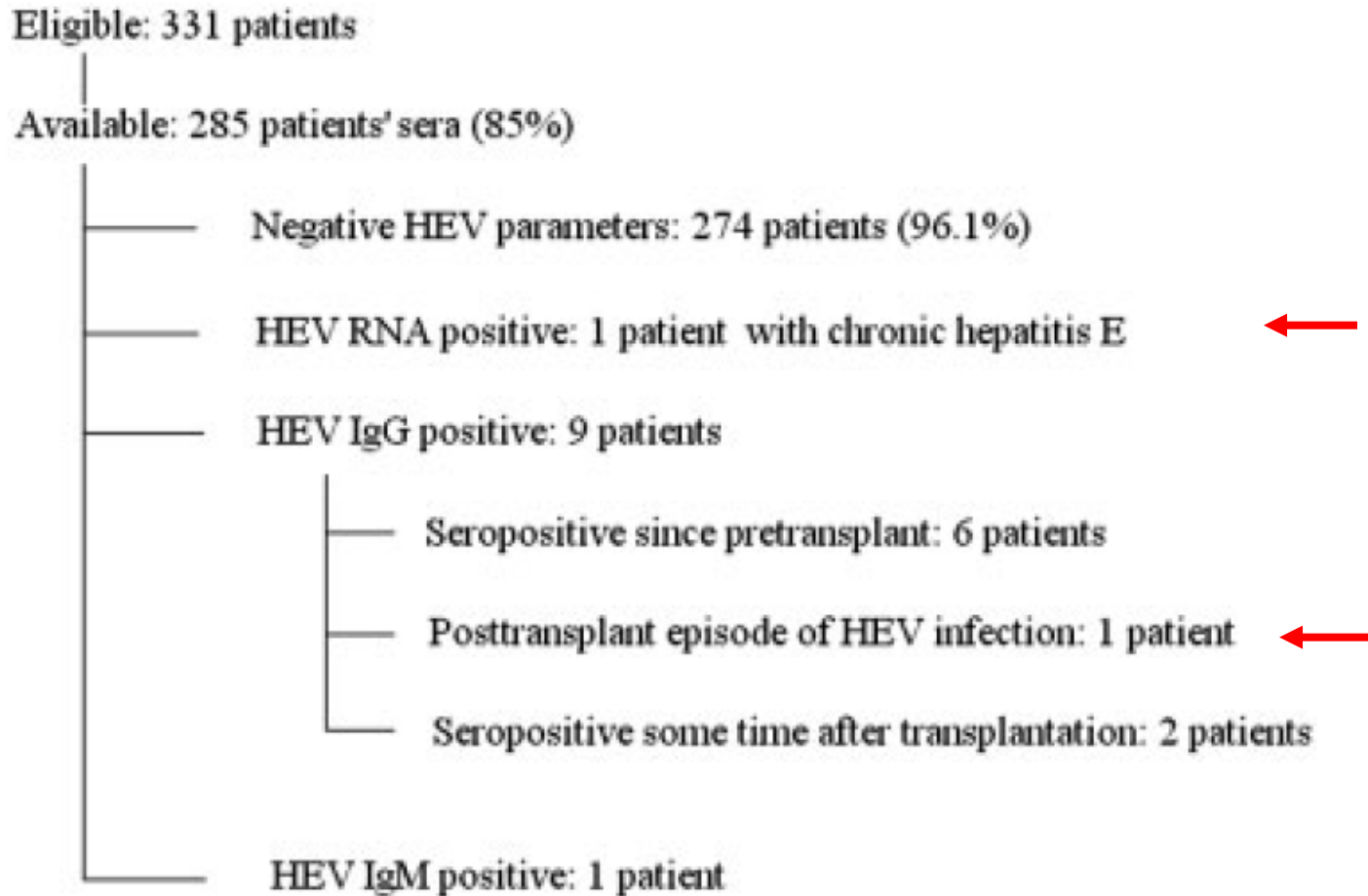
**Median FU: 22 mo**

**Median FU: 22 mo**

HEV RNA positive: none  
No reactivation

Anti-HEV  
seroconversion: 14  
HEV RNA +: 20  
**34 de novo  
infections**

# Prevalence and incidence of HEV infection in liver-transplant patients (The Netherlands)



**Incidence  $\approx$  2%**

# HEV seroprevalence in liver-transplant patients (Germany)

| Group  | Number of Patients | Anti-HEV IgG-Positive | Anti-HEV IgM-Positive | HEV RNA-Positive |
|--|--------------------|-----------------------|-----------------------|------------------|
| Healthy controls   | 108                | 1 (0.9%)              | 0/1*                  | 0/1*             |
| Nontransplanted patients with chronic liver disease            | 108                | 4 (3.1%)              | 1 (0.8%)              | 1/129 (0.8%)     |
| Liver transplant recipients with no graft hepatitis (group A)  | 156                | 7 (4.5%)              | 0 (0%)                | 0/156 (0%)       |
| Liver transplant recipients with elevated ALT levels (group B) | 70                 | 3 (4.3%)              | 2 (2.9%)              | 2/70 (2.9%)      |

# HEV seroprevalence in kidney and liver-transplant patients (Spain)

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- ❖ Between July and August 2008, 108 Kidney-, or liver-transplant recipients were tested for HEV
  - 82 liver-transplant recipients
  - 21 kidney-transplant recipients
  - 5 dual-organ recipients
  
- ❖ Anti-HEV IgG was detected in only 3/ 108 patients **(2.1%)**

# Case control study to investigate the source of contamination in solid-organ-transplant patients

- 37 SOT patients matched to 148 other SOT patients for age and gender
- Questionnaire: living conditions, food, drink, and leisure activity

|                              | Case subjects (%) | Control subjects (%) | P     | Odds Ratios (95% CI) |
|------------------------------|-------------------|----------------------|-------|----------------------|
| <b>Bivariate analysis</b>    |                   |                      |       |                      |
| Eating game meat             | 67%               | 47%                  | 0.03  | 2.3 (1.04-5.22)      |
| Eating pork product          | 97%               | 83%                  | 0.03  | 6.82 (0.86 -53.9)    |
| Eating mussels               | 100%              | 77%                  | 0.002 | 10 (1.25 -79.7)      |
| <b>Multivariate analysis</b> |                   |                      |       |                      |
| Eating game meat             | 67%               | 47%                  | 0.03  | 2.3 (1.04 -5.22)     |



# Natural history of HEV infection in solid-organ transplant patients

- Multicenter study: 17 centers in Europe and 1 in USA
- **85** solid-organ-transplant patients
  - ✓ Toulouse (n= 52);
  - ✓ Groningen (The Netherlands, n=5);
  - ✓ Montpellier (n= 4);
  - ✓ Hannover (Germany, n=3);
  - ✓ Lyon (Edouard Herriot n=3);
  - ✓ Lille (n=3);
  - ✓ Nice (n=2);
  - ✓ Necker (n=2);
  - ✓ Saint Antoine (n=2);
  - ✓ Pitié Salpêtrière (n=2);
  - ✓ Royal Cornwall Hospital (UK, n=1);
  - ✓ Sioux Falls (USA, n=1);
  - ✓ Saint Luc Hospital (Belgium, n=1);
  - ✓ Limoges ( n=1);
  - ✓ Dijon ( n=1);
  - ✓ Lyon Nord Croix Rousse n=1);
  - ✓ Paul Brousse (n=1).
- ✓ **Kidney (n= 47);**
- ✓ **Liver (n=26);**
- ✓ **Liver-kidney (n= 2);**
- ✓ **Kidney-pancreas (n=6);**
- ✓ **Islet (n=1);**
- ✓ **Heart (n=2);**
- ✓ **Lung (n=1);**

# Clinical and biological at diagnosis

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- Only 32% were symptomatic (fatigue+++)
- 35% had contact with animals
- Anti-HEV IgG: 78 tested, 41% positive
- Anti-HEV IgM: 78 tested, 80.8% positive
- HEV RNA: 82 tested, 100% positive
- Genotype 64 tested. 59 genotype 3 (5 not amplified)
- ALT :  $260 \pm 38$  IU/L (vs.  $42 \pm 8$ ,  $p < 0.0001$ )
- AST:  $155 \pm 25$  IU/L (vs.  $29 \pm 3$ ,  $p < 0.0001$ )
- $\gamma$ GT:  $308 \pm 56$  IU/L (vs.  $90 \pm 20$ ,  $p < 0.0001$ )
- Total bilirubin:  $22.5 \pm 3.8$   $\mu$ mol/L (vs.  $11.2 \pm 0.8$ ,  $p = 0.005$ ).

# Outcome

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**85 pts with a FU > 6 months**

**29 cleared the virus within the 6 Months after diagnosis:**

**Acute hepatitis E (34.1%)**

**56 evolved to chronic hepatitis (> 6 months):**

**Chronic hepatitis E (65.9%)**

**No reactivation was observed**

**Chronic hepatitis rate:**

- Toulouse: 57.8%
- Outside Toulouse: 78.8%

**Evolution to cirrhosis: 8/85 (9.4%)**

# Predictive factors for chronic hepatitis: Multicenter study

## Univariate analysis

| <b>Variables<br/><i>At diagnosis</i></b> | <b>Patients with<br/>resolving HEV<br/>infection<br/>(<i>n</i> =29)</b> | <b>Patients with<br/>chronic hepatitis<br/>(<i>n</i>=56)</b> | <b><i>P</i></b> |
|--|---|--|-----------------|
| Liver/non-liver transplant               | 5/24  | 23/33  | 0.05            |
| Time last AR /HEV (days)                 | 102±93  | 29.5±31  | 0.03            |
| Time since transplantation (m)           | 70.3±52.8   | 41.4±38  | 0.005           |
| AST (IU/L)                               | 107 (16–1,571)  | 94 (21–436)  | 0.02            |
| ALT (IU/L)                               | 263 (24–2,675)  | 135 (28–874)   | 0.001           |
| Peak AST level (IU/L)                    | 223 (31–1,571)  | 147 (39–874)   | 0.001           |
| Peak ALT level (IU/L)                    | 272 (29–2,675)  | 167 (32–522)   | 0.005           |
| Serum creatinine (µmol/L)                | 168±69  | 130±51   | 0.005           |
| Platelet count (/mm <sup>3</sup> )       | 225,655±62,521  | 190,384±79,903   | 0.04            |
| Cyclosporin A / Tacrolimus               | 9/13  | 4/43   | 0.003           |

# Predictive factors for chronic hepatitis: Multicenter study

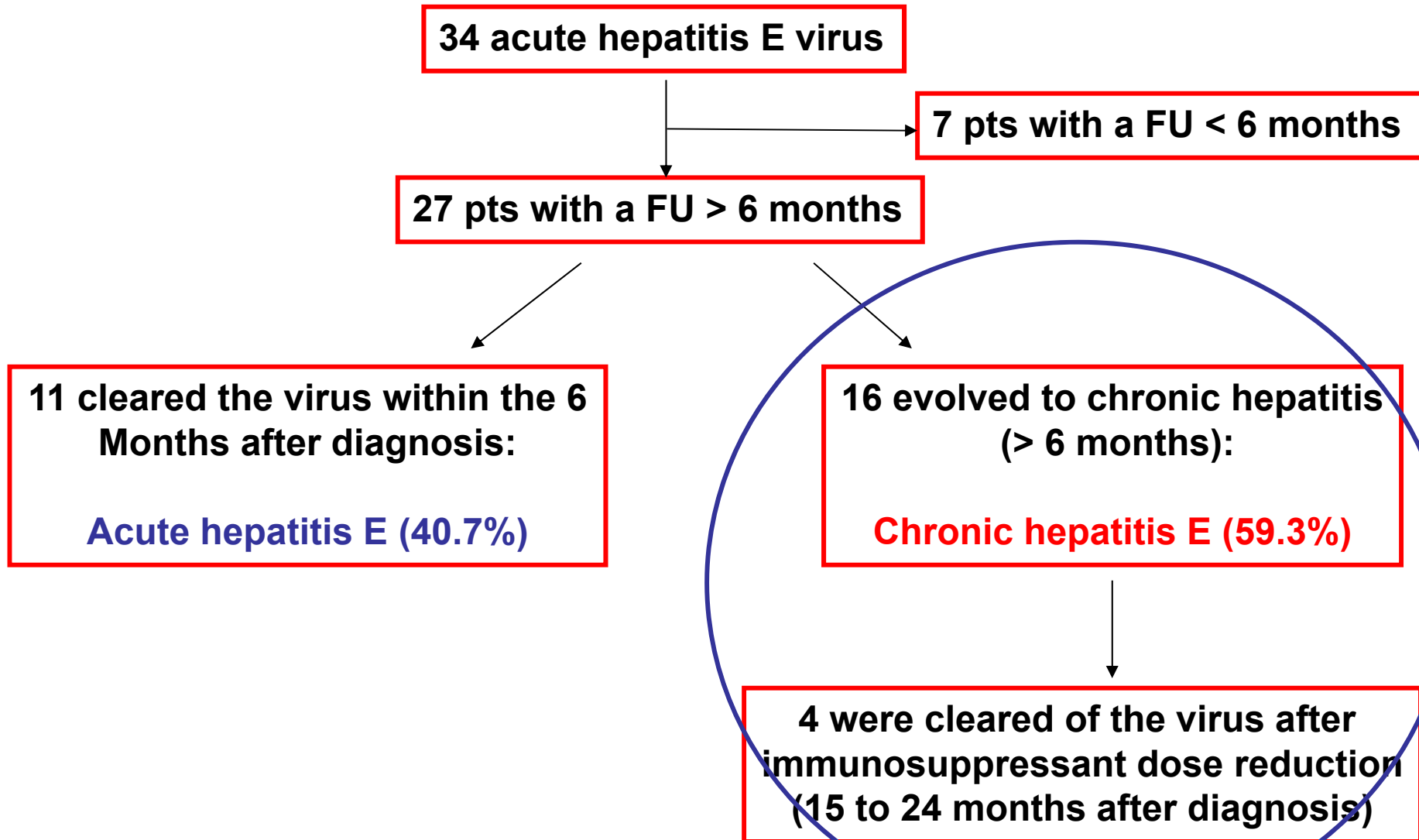
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## Multivariate analysis

| <b>Variables</b><br><i>At diagnosis</i> | <b>OR</b> | <b>CI<sub>95%</sub></b> | <b>P</b> |
|---|-----------|-------------------------|----------|
| Platelet count (/mm <sup>3</sup> )      | 1.02      | 1.001–1.1               | 0.04     |
| Cyclosporin A / Tacrolimus              | 1.87      | 1.49–1.97               | 0.004    |

# **Management of chronic hepatitis E virus infection**

# Outcome



## Differences between chronic patients who remained viremic and those with who were cleared of the virus

| Variables                                  | Patients with chronic HEV infection who remained viremic (n =12) | Patients with chronic HEV infection who were cleared off the virus (n=4) | P     |
|--|--|--|-------|
| Kidney or SKP/liver Tx organ               | 9/3  | 0/4  | 0.02  |
| AST at last FU (IU/L)                      | 72 (26-308)  | 17 (8-67)  | 0.03  |
| ALT at last FU (IU/L)                      | 99 (42-257)  | 16.5 (8-56)  | 0.005 |
| Activity score at last LB                  | 2 (1-3)  | 1 (0-1)  | 0.02  |
| Induction therapy at Tx: Y/N               | 11/1   | 1/3  | 0.03  |
| C0 Tac at last FU (ng/mL)                  | 7.35 (3.8-11.2)  | 3.25 (2.5-6.5)   | 0.02  |
| Steroids (mg/kg/d) at last FU              | 0.1 (0.06-0.1)   | 0.035 (0.03-0.04)  | 0.04  |
| CD3 + cells at last FU (/mm <sup>3</sup> ) | 427 (344-783)  | 1033 (440-1570)  | 0.05  |
| CD4 + cells at last FU (/mm <sup>3</sup> ) | 261 (167-292)  | 369 (322-444)  | 0.02  |

Immunosuppressant dose reduction may be a first-line therapeutic option



# Outcome: Multicenter study

---

**85 pts with a FU > 6 months**

**29 cleared the virus within the 6  
Months after diagnosis:**

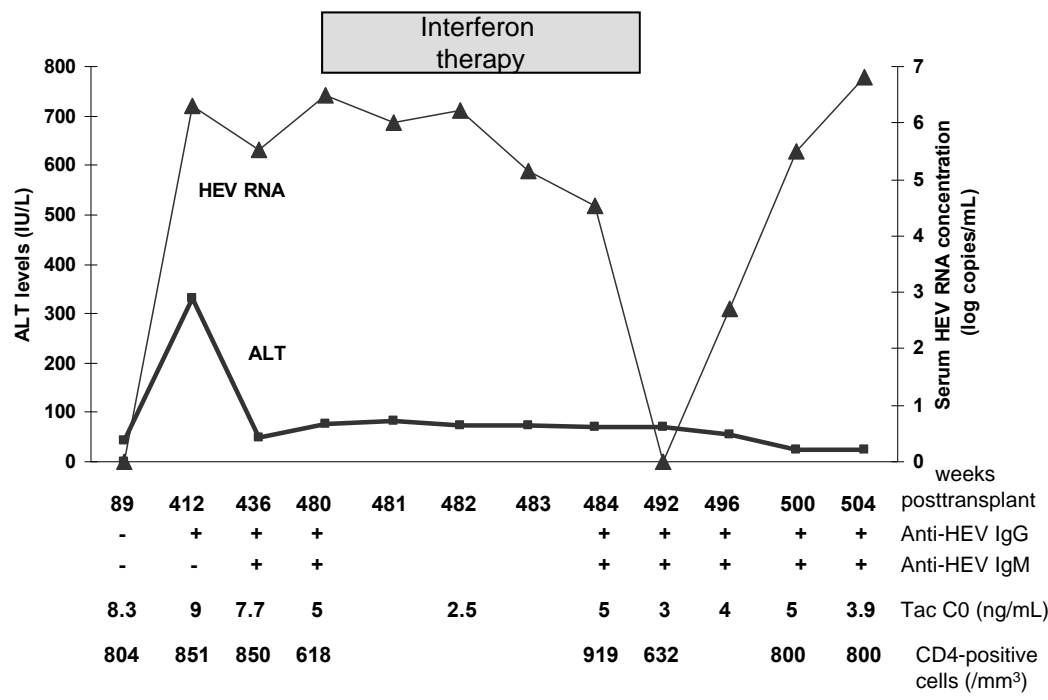
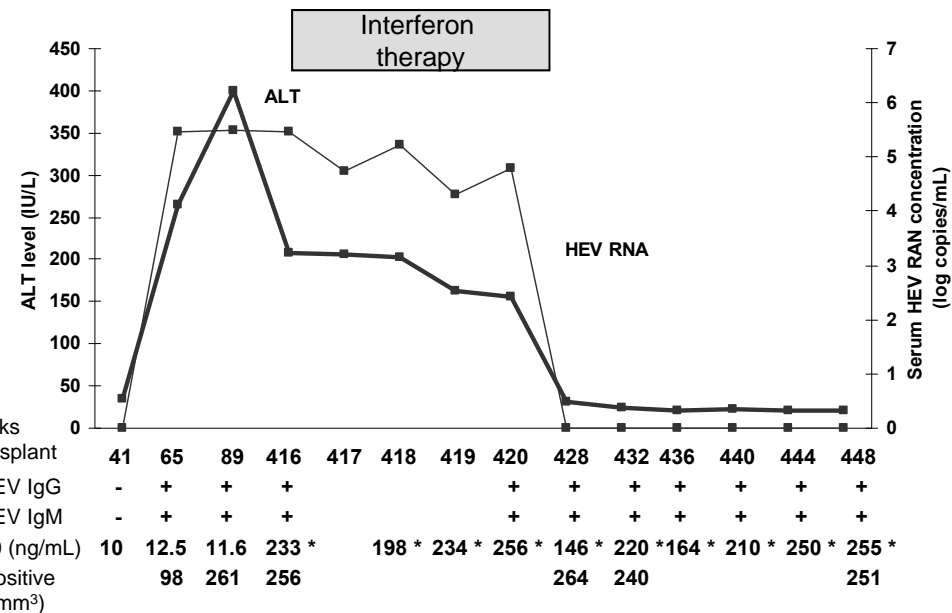
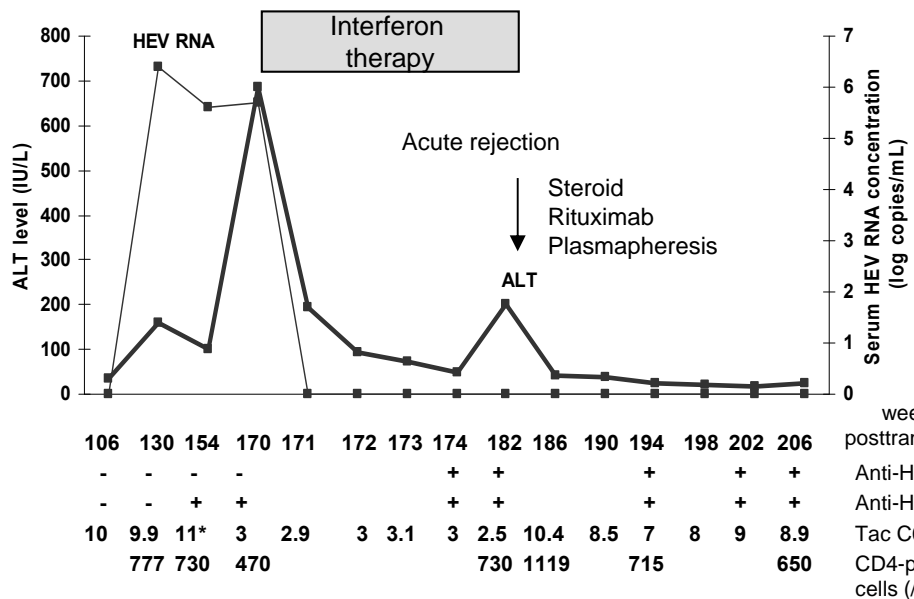
**Acute hepatitis E (34.1%)**

**56 evolved to chronic hepatitis  
(> 6 months):**

**Chronic hepatitis E (65.9%)**

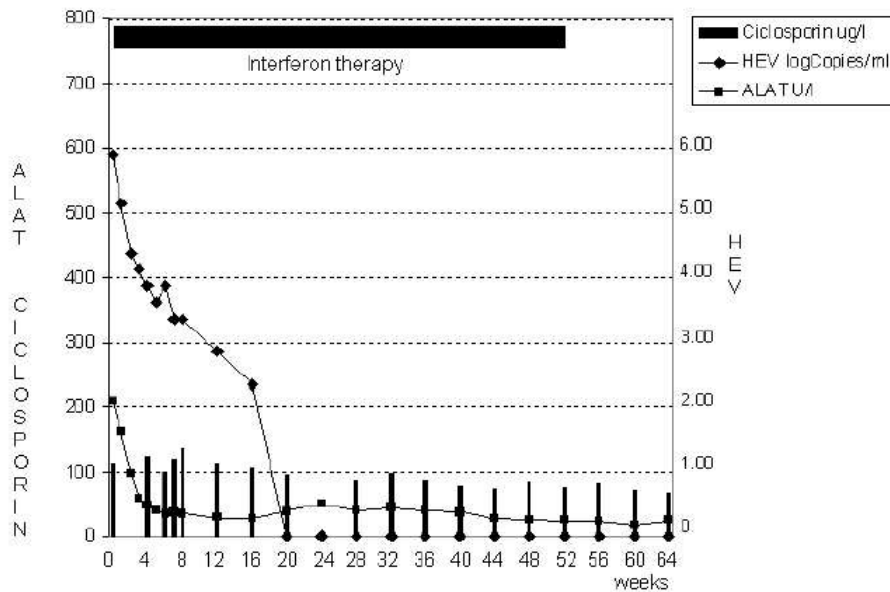
**18 were cleared of the virus after  
immunosuppressant dose reduction  
(32.1%)**

# **Pegylated-alpha interferon for chronic HEV infection**



- **Three liver-transplant patients with chronic HEV infection**
- **Pegylated interferon alpha-2a**
- **135 µg/week**
- **Three months**
- **SVR: 2 out of 3**

## Liver-Transplant patient with chronic HEV infection



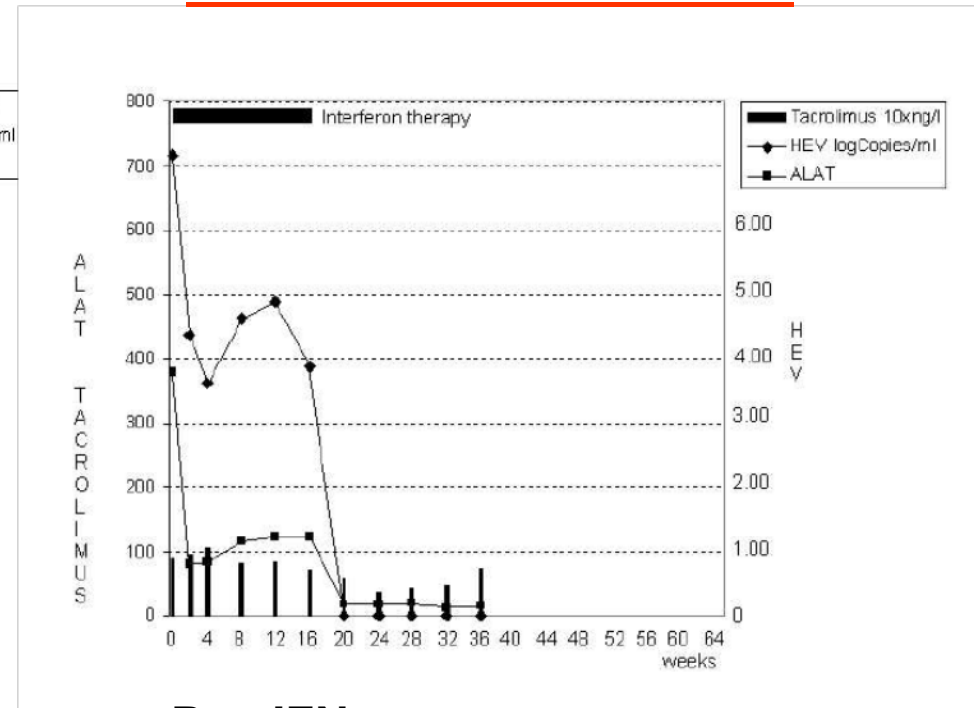
**Peg IFN** (27 mo after re-OLT)  
( 9 years post-infection)

- 100 µg for 4 weeks
- 80 µg for 16 weeks
- 60 µg for 32 weeks
- Total 52 weeks**

**No relapse 3 months after Peg-IFN**

*Haagsma et al., Liver Transplant 2010*

## Liver-Transplant patient with chronic HEV infection



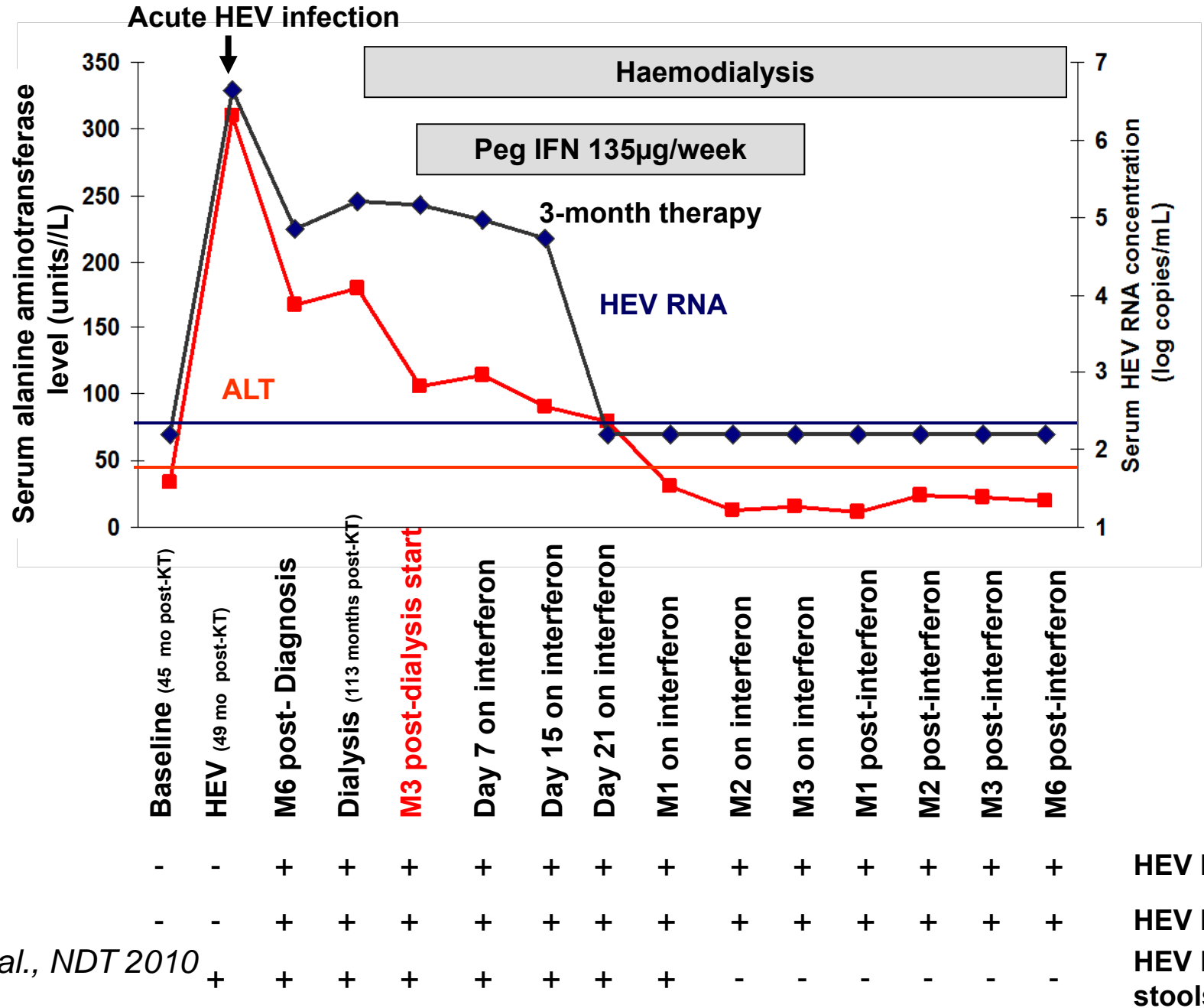
**Peg IFN** (9 mo after OLT)

- 150 µg for 4 weeks
- 120 µg for 4 weeks
- 90 to 100 µg for 8 weeks
- Total 16 weeks**

**HEV clearance at week 20 (4 weeks after Peg-IFN therapy).**

**Effect of Tac C0 decrease?**

# Hemodialysis patient with chronic HEV infection



Kamar et al., NDT 2010

# **Ribavirin for chronic HEV infection**

# Ribavirin monotherapy for chronic HEV infection in SOT patients

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✓ 2 patients:

- Ribavirin: 12 mg/kg/d for 3 months
- HEV clearance: 2 patients, but short follow-up.  
(Mallet, *Ann Intern Med* 2010)

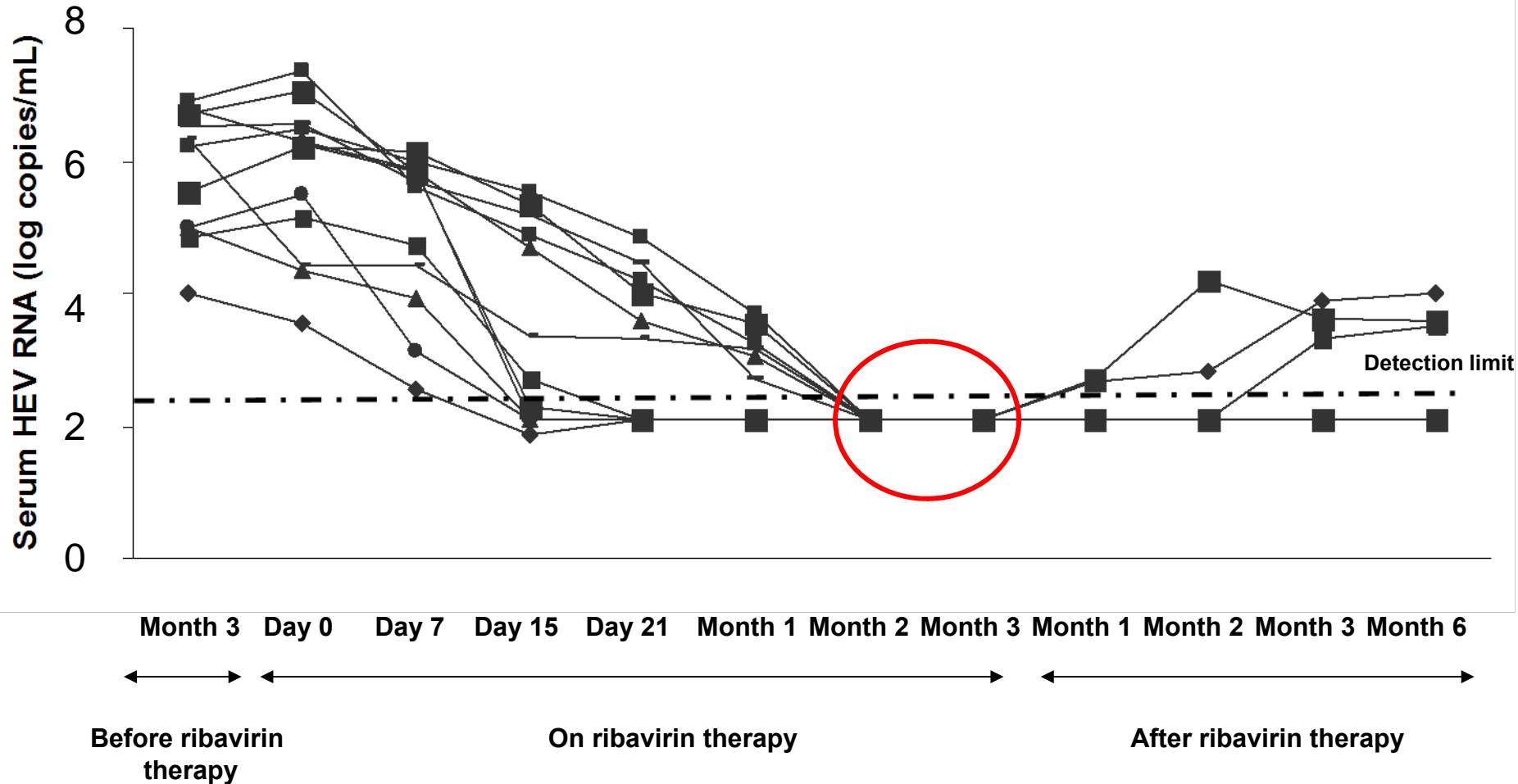
✓ 8 patients,

- Ribavirin: 400 to 800 mg/d for 3 months
- 6 patients with long FU: SVR in 4 patients
- 2 patients with short FU: HEV clearance in 2 patients  
(Kamar, *Gastroenterology* 2010)

✓ 1 patients (heart-transplant patient)

- Ribavirin: 17 mg/kg/d for 3 months
- HEV clearance, 4 months FU after ribavirin cessation.  
(Chaillon, *J Heart Lung Transplantation* 2011)

# Virological response

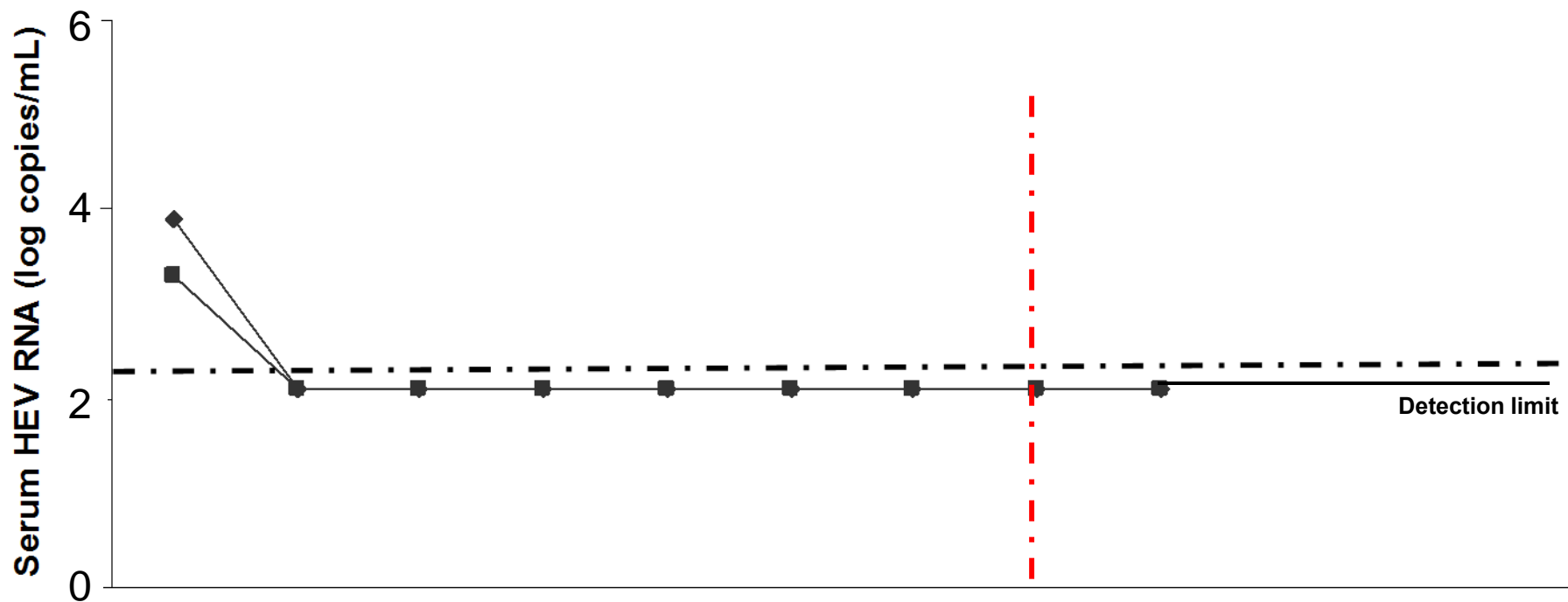


- 10 patients had > 6 months FU after therapy
- **SVR: 7 patients**
- **Relapse: 3 patients**
- 2 patients were cleared of the virus at the end of therapy

*Unpublished data*



# Virological response after 6 months ribavirin therapy in 2 relapsers



Day 0 Day 7 Day 15 Day 21 Month 1 Month 2 Month 3 Month 6 Month 1 Month 2 Month 3 Month 6

← On ribavirin therapy After ribavirin therapy →

**2 SVR**

**Extra-hepatic HEV manifestations:**

**Neurological disorders**

# Neurological symptoms and HEV infection

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- ✓ Retrospective study between 2004-2009
- ✓ 126 patients with acute or chronic locally acquired genotype 3 HEV infection
- ✓ 2 countries:
  - Toulouse (France):
    - Transplant unit: 50
    - Hepatology unit: 21
  - Truro (UK):
    - Hepatology unit: 55
- ✓ Incidence of neurological disorders: 7/126 (5.5%)

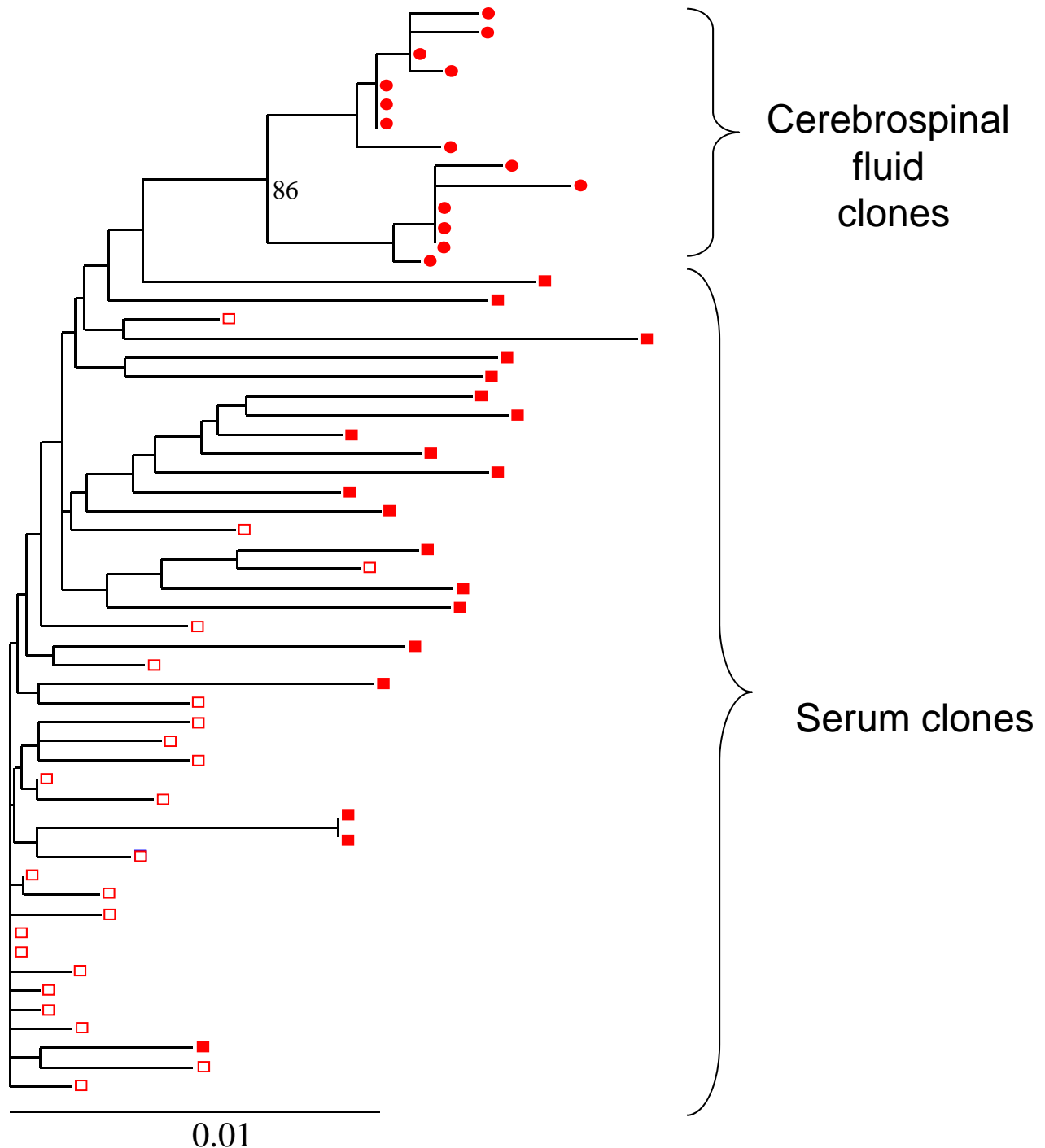
# HEV may induce peripheral neurological symptoms

| Pts | Type of patient            | HEV phase | HEV genotype | HEV IgG/IgM | Serum   |            |                    | CSF     |                     |                         |
|-----|----------------------------|-----------|--------------|-------------|---------|------------|--------------------|---------|---------------------|-------------------------|
|     |                            |           |              |             | HEV RNA | ALT (IU/L) | Bilirubin (μmol/L) | HEV RNA | Protein level (g/L) | WBC (/mm <sup>3</sup> ) |
| 1   | Non immunocompromized      | Acute     | 3e           | +/+         | +       | 623        | 14                 | -       | 1.27                | 145                     |
| 2   | Non immunocompromized      | Acute     | 3e           | +/+         | +       | 1160       | 70                 | ND      | -                   | -                       |
| 3   | Non immunocompromized      | Acute     | 3f           | +/+         | +       | 384        | 35                 | -       | 2                   | 14                      |
| 4   | Kidney-pancreas transplant | Chronic   | 3f           | +/+         | +       | 171        | 19                 | +       | 0.71                | 1                       |
| 5   | Kidney-transplant          | Chronic   | 3f           | -/+         | +       | 110        | 12                 | +       | 0.8                 | 8                       |
| 6   | Kidney-transplant          | Chronic   | 3f           | +/+         | +       | 105        | 12                 | +       | 0.76                | 7                       |
| 7   | HIV-positive               | Chronic   | 3a           | +/+         | +       | 150        | 9                  | +       | 0.47                | 1                       |

|   | Neurological symptoms   | Therapy                  | Outcome                                |
|---|---|--------------------------|--|
| 1 | Acute inflammatory polyradiculoneuropathy   | -                        | Complete resolution                    |
| 2 | Bilateral brachial neuritis   | -                        | Resolution with residual weakness      |
| 3 | Guillain-Barré Syndrome   | IV Ig                    | Resolution at HEV clearance            |
| 4 | Ataxia, severe proximal weakness of his lower limbs, urine retention, and cognitive dysfunction | IS modification          | Resolution with residual motor deficit |
| 5 | Encephalitis  | IS Stop, Foscavir, IV Ig | Complete resolution                    |
| 6 | Peripheral demyelinating polyradiculoneuropathy   | IS modification, IV Ig   | No improvement                         |
| 7 | Painful sensory peripheral neuropathy   | Peg-IFN/ ribavirin       | Complete resolution                    |

HEV Genotype 3f,  
Genbank number  
FJ665423

**Are neurological  
symptoms linked to  
the emergence of  
neurotropic variants ?**



# Summary (1)

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- ❖ HEV infection may evolve to chronic hepatitis in immunosuppressed patients
- ❖ Characteristics of HEV infection in solid organ-transplant patients
  - Majority of patients are asymptomatic
  - The increase of liver enzymes levels is less marked than in immunocompetent patients
  - Seroconversion is delayed and may never occur

## Summary (2)

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- ❖ HEV infection evolves to chronic hepatitis in nearly 60 % of transplant patients.
- ❖ HEV infection may evolve to cirrhosis and may recur after retransplantation
- ❖ The reduction of immunosuppressive drugs targeting T-cells should be considered as a first-line therapeutic option
- ❖ Pegylated-interferon therapy and ribavirin are efficient anti-viral therapies against HEV
- ❖ HEV induces neurological symptoms

# Acknowledgments

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**Thank you for your attention**