

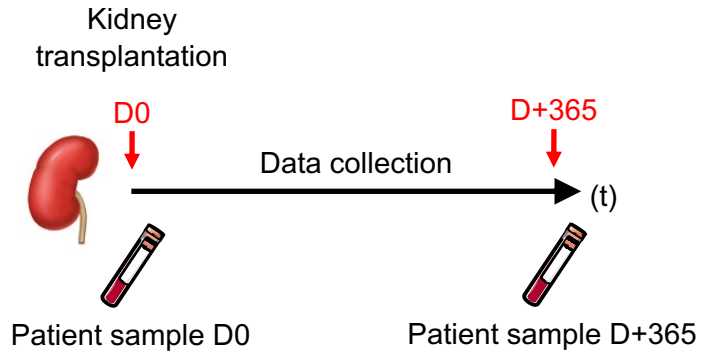
**Supplementary Figure 1: Study design and VirScan procedure.** A) Study design and sample collection. B) The virome peptide library consists of 93,904 56 amino acid peptides tiling across the proteomes of 206 species of virus. DNA sequences encoding the peptides are cloned into a T7 bacteriophage display vector for screening. Amplification and sequencing of the insert DNA from bound phage reveals peptides targeted by potential antiviral antibodies from the sample.

**Supplementary Figure 2: Example of the antibody response to HHV5 peptides.** Patient 29 had a negative ELISA test at D0 for HHV5 (IgG and IgM) and a positive VirScan test with 12 specific enriched peptides at D0 (threshold > 5 for HHV5). At D+365, HHV5 ELISA test turned to positive for both IgG and IgM in this patient arguing in favor of a recent HHV5 infection. The multiplexed VirScan approach revealed a boost in HHV5 enriched peptides from 12 to 37 specific hits between D0 and D+365, suggesting that the D0 ELISA test for HHV5 was probably a false negative result with a patient starting HHV5 infection at the time of transplantation.

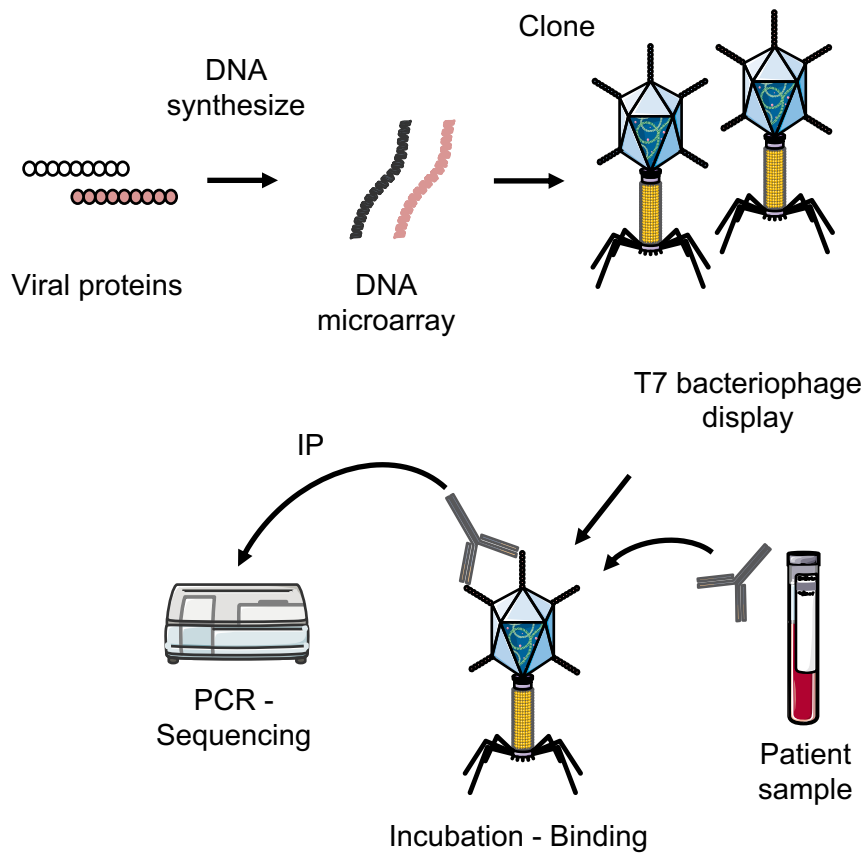
**Supplementary Figure 3: Example of seroconversion in one patient.** Antibody response to one of the HHV5 protein (Uniprot ID P08318) in patient 21 at D0 and then D+365.

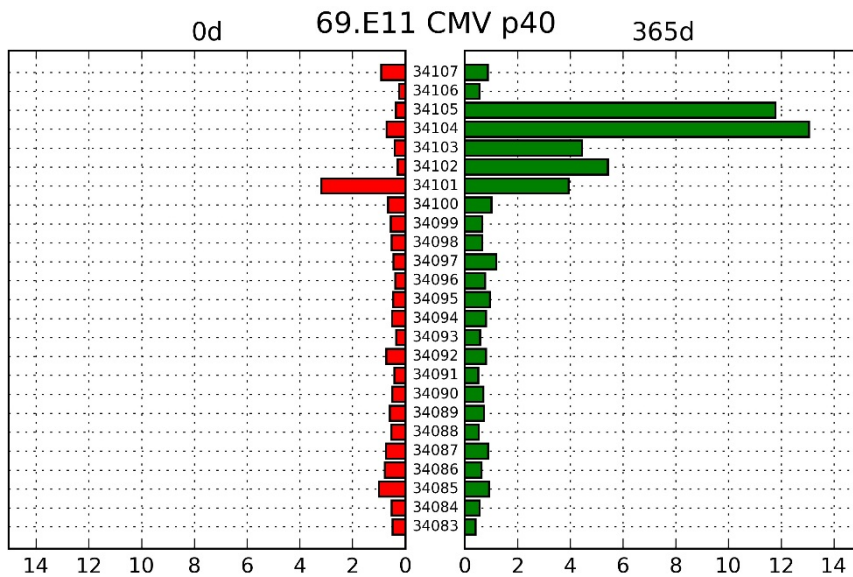
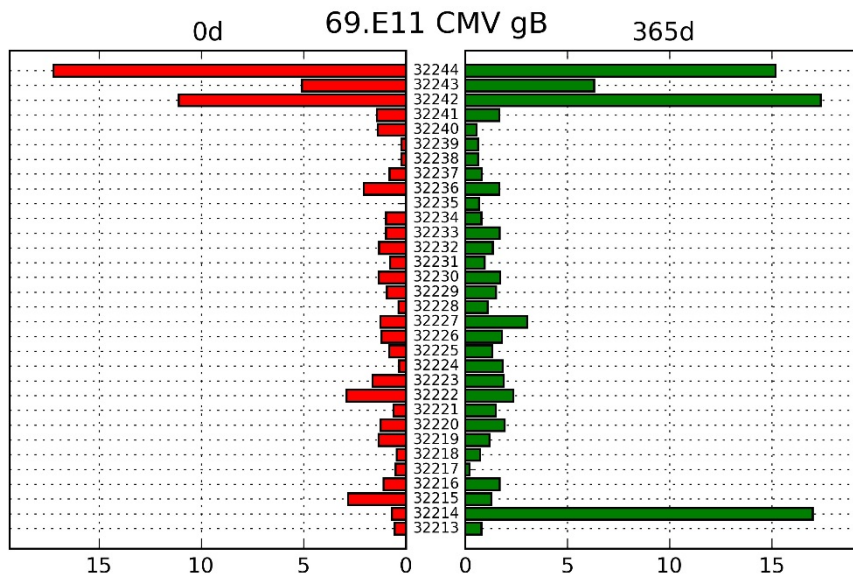
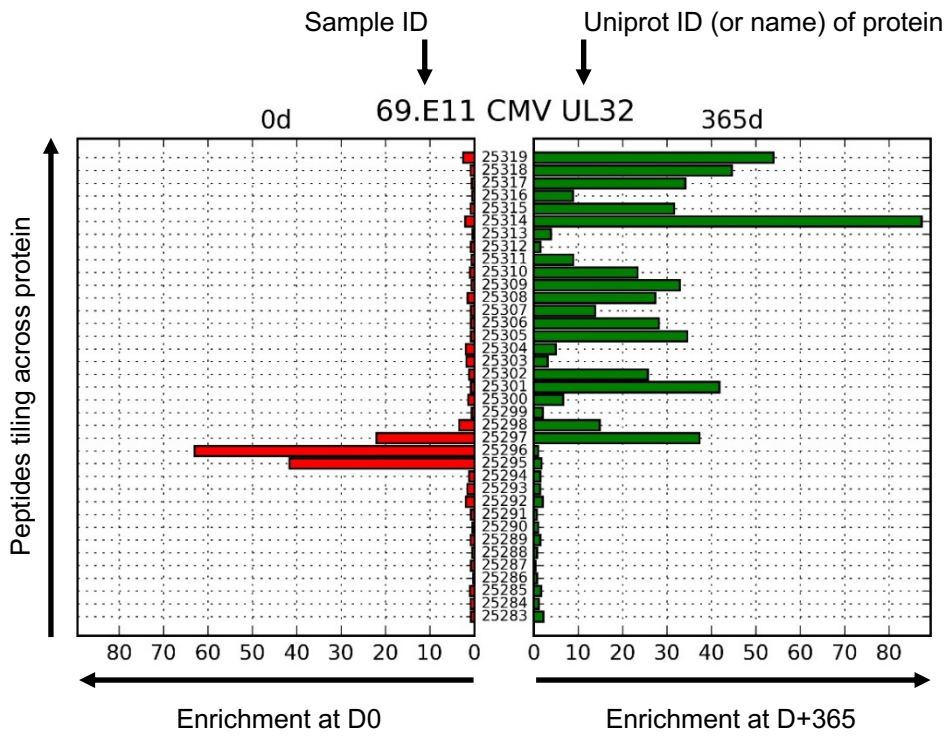
**Supplementary Figure 4: Antibody response to peptide is conserved even in patients treated with Rituximab.** A) Heatmap showing the change in the number of enriched epitopes from each virus from the D0 to the D+365 timepoint. Each column represents a patient. B) Example of antibody response to three different HHV5 proteins (Uniprot ID gB, UL32 and p40) at D0 and D+365 for one transplant recipient. The antibody response is highly conserved. C) Example of antibody response to three different HHV5 proteins (Uniprot ID gB, UL32 and p40) at D0 and D+365 for one transplant recipient treated with Rituximab. The antibody response is highly conserved.

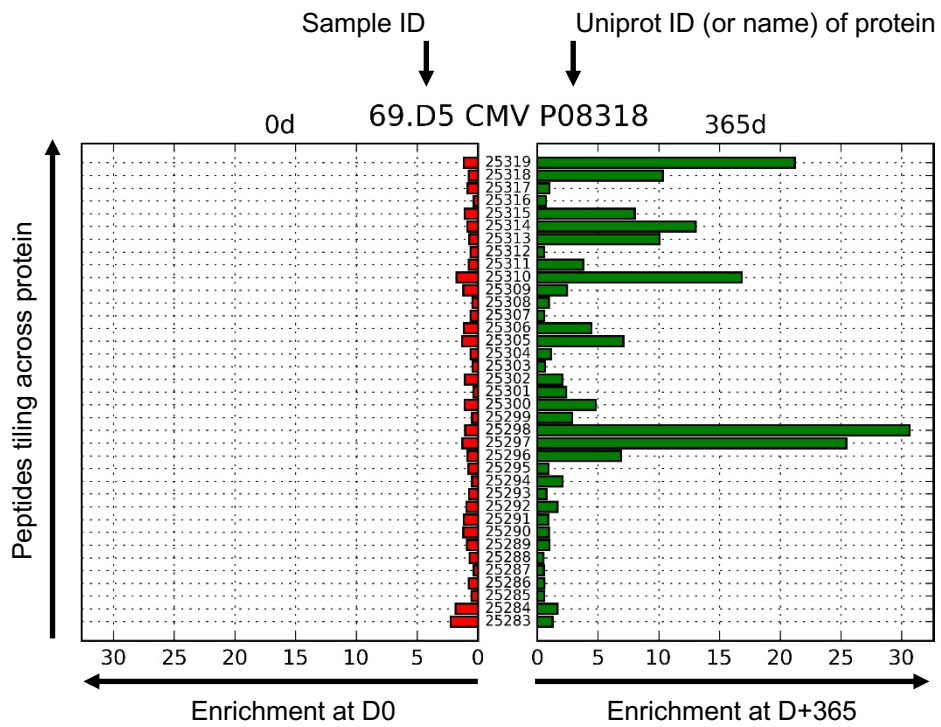
A



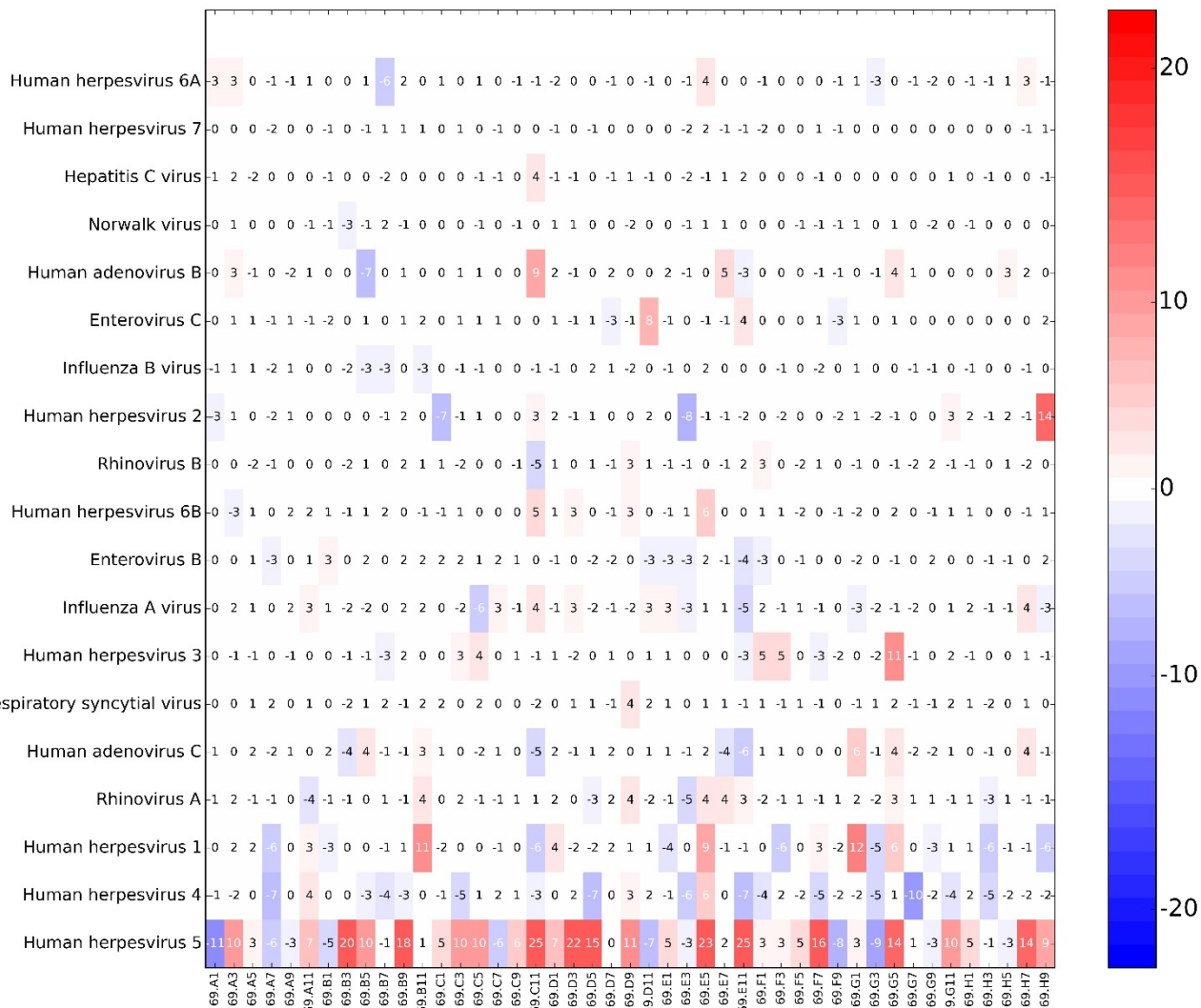
B





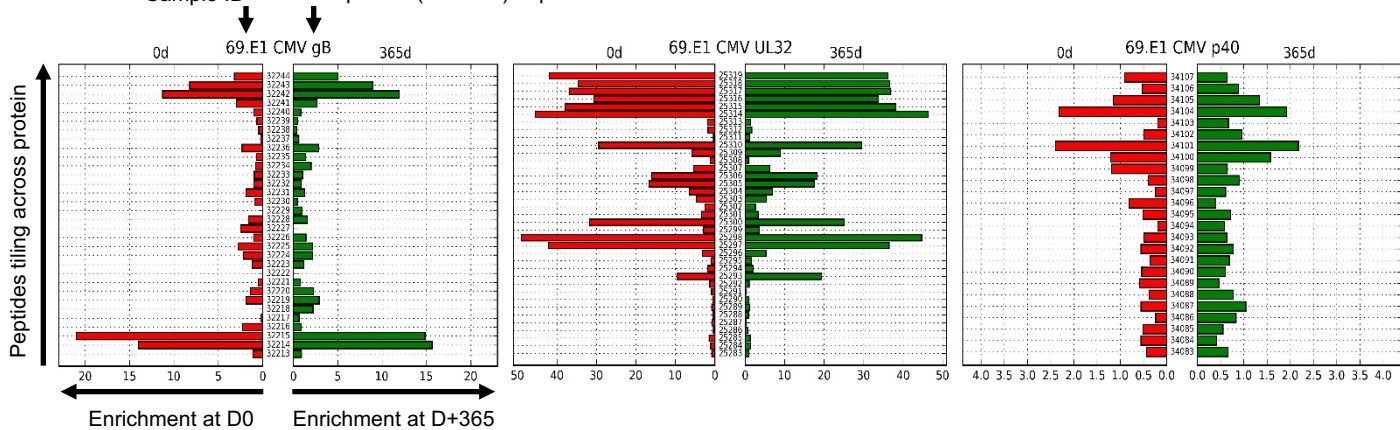


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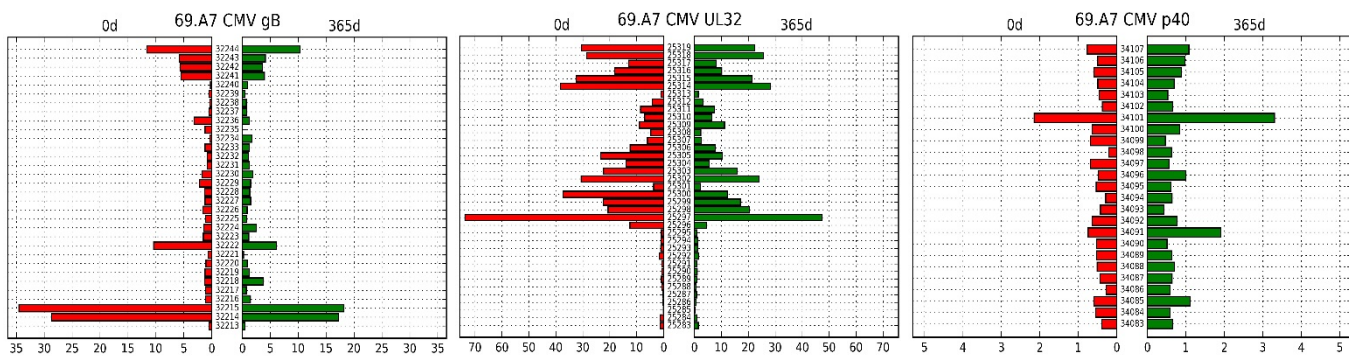


B

Sample ID      Uniprot ID (or name) of protein



C



**Supplementary Table 1: Immunosuppressive regimen per patient**

Patient	Prior KT (number)	Rituximab	PE	IVIg	Thymo.	Bortezomib	Rejection	Recurrent disease
1	1	0	0	0	0	0	0	0
2	0	0	1	1	0	0	Humoral	0
3	2	0	0	1	0	0	0	0
4	1	1	1	1	0	0	Humoral	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	1	0	0	Humoral	0
8	1	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	1	0	0	1	0	0	0	0
13	0	0	0	1	0	0	0	0
14	0	0	0	1	0	0	0	0
15	0	0	0	0	0	0	0	0
16	1	1	1	1	0	0	0	0
17	0	0	0	0	1	1	Humoral	1
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	Cellular	0
23	0	0	0	1	0	0	0	0
24	1	0	0	1	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	1	1	1	0	Mixed	1
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	1	0	0	1	0	0	0	0
31	1	0	0	1	0	0	0	0
32	0	1	1	1	0	0	Humoral	0
33	0	0	0	0	0	0	0	0
34	0	0	0	1	0	0	0	0
35	1	0	1	1	0	0	0	0
36	0	0	0	0	0	0	0	0
37	1	0	0	1	0	0	0	0
38	0	0	0	0	0	0	0	0
39	1	1	1	1	0	0	0	0
40	1	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0
44	2	0	0	1	0	0	0	0
45	0	0	0	0	0	0	0	0

KT: Kidney transplantation; PE: Plasmapheresis exchange; IVIg: Intravenous immunoglobulin; Thymo.: Thymoglobulin.

**Supplementary Table 2: HHV5 detection for patient 29**

	D0	D+90	D+365
PCR HHV5 (Copies/ml)	< 446	< 446	< 446
ELISA Test IgG (UA/ml)	< 14	< 14	42
ELISA Test IgM (UA/ml)	< 22	59,2	42
VirScan Enriched peptides	12	-	37

HHV: Human herpes virus



**Supplementary Table 3: VirScan and ELISA test at D0**

Patient ID	HIV1		HIV2		HCV		HHV5		HHV4		HHV8	
	HIV1 ELISA D0	VirScan D0 (enriched peptides)	ELISA D0	VirScan D0 (enriched peptides)	ELISA D0	VirScan D0 (enriched peptides)	ELISA D0	VirScan D0 (enriched peptides)	ELISA D0	VirScan D0 (enriched peptides)	ELISA D0	VirScan D0 (enriched peptides)
1	0	0	0	0	0	0	1	1 (30)	1	1 (26)	0	0
2	0	0	0	0	0	0	1	1 (21)	1	1 (9)	0	0
3	0	0	0	0	1	1 (6)	0	0	1	1 (19)	0	0
4	0	0	0	0	0	0	1	1 (53)	1	1 (30)	0	0
5	0	0	0	0	0	0	1	1 (16)	1	1 (28)	0	0
6	0	0	0	0	0	0	1	1 (34)	1	1 (21)	0	0
7	0	0	0	0	0	0	1	1 (26)	1	1 (14)	0	0
8	0	0	0	0	0	0	0	0	1	1 (8)	0	0
9	0	0	0	0	0	0	1	1 (26)	1	1 (24)	0	0
10	0	0	0	0	0	0	0	0	1	1 (23)	0	0
11	0	0	0	0	0	0	0	0	1	1 (35)	0	0
12	0	0	0	0	0	0	1	1 (43)	1	1 (21)	0	0
13	1	1 (14)	0	0	0	0	1	1 (43)	1	1 (31)	0	0
14	0	0	0	0	0	0	1	1 (12)	1	1 (43)	0	0
15	0	0	0	0	0	0	1	1 (15)	1	1 (10)	0	0
16	0	0	0	0	0	0	1	1 (9)	1	1 (49)	0	0
17	0	0	0	0	0	0	1	1 (16)	1	1 (17)	0	0
18	0	0	0	0	0	0	0	0	1	1 (18)	0	0
19	0	0	0	0	1	1 (7)	1	1 (18)	1	1 (23)	0	0
20	0	0	0	0	0	0	1	1 (26)	1	1 (40)	0	0
21	0	0	0	0	0	0	0	0	1	1 (48)	0	0
22	0	0	0	0	0	0	0	0	1	1 (36)	0	0
23	0	0	0	0	0	0	1	1 (38)	1	1 (39)	0	0
24	0	0	0	0	0	0	1	1 (32)	1	1 (29)	0	0
25	0	0	0	0	0	0	1	1 (36)	1	1 (14)	0	0
26	0	0	0	0	0	0	0	0	1	1 (30)	0	0
27	0	0	0	0	0	0	1	1 (14)	1	1 (12)	0	0
28	0	0	0	0	0	0	1	1 (21)	1	1 (20)	0	0
29	0	0	0	0	0	0	0	1 (12)	1	1 (19)	0	0
30	0	0	0	0	1	1 (19)	1	1 (39)	1	1 (36)	0	0
31	0	0	0	0	0	0	1	1 (24)	1	1 (19)	0	0
32	0	0	0	0	0	0	0	0	1	1 (13)	0	0
33	0	0	0	0	0	0	1	1 (14)	1	1 (38)	0	0
34	0	0	0	0	0	0	1	1 (31)	1	1 (14)	0	0
35	0	0	0	0	0	0	1	1 (26)	1	1 (39)	0	0
36	0	0	0	0	0	0	1	1 (27)	1	1 (22)	0	0
37	0	0	0	0	0	0	1	1 (25)	1	1 (38)	0	0
38	0	0	0	0	0	0	1	1 (31)	1	1 (31)	0	0
39	0	0	0	0	0	0	1	1 (18)	1	1 (28)	0	0
40	0	0	0	0	0	0	1	1 (46)	1	1 (31)	0	0
41	0	0	0	0	0	0	1	1 (22)	1	1 (14)	0	0
42	0	0	0	0	0	0	0	0	1	1 (18)	0	0
43	0	0	0	0	0	0	1	1 (46)	1	1 (24)	0	0
44	0	0	0	0	0	0	1	1 (31)	1	1 (12)	1	1 (8)
45	0	0	0	0	0	0	1	1 (43)	1	1 (30)	0	0

HHV: Human herpes virus; HIV: Human immunodeficiency virus; HCV: Hepatitis

**Supplementary Table 4: Negative results obtained with ELISA and PCR compared to VirScan**

Patient	Virus	D0 ELISA	Negative PCR (Day post transplantation)	VirScan at D0	Virscan at D+365
3	HHV 5	Neg	D0, D+42, D+56	Neg	Neg
4	HCV	Neg	D+162	Neg	Neg
6	HCV	Neg	D0	Neg	Neg
10	HHV 5	Neg	D+168	Neg	Neg
23	HCV	Neg	D+66, D+120	Neg	Neg
26	HHV 5	Neg	D+84	Neg	Neg
27	HCV	Neg	D+204	Neg	Neg
31	HCV	Neg	D0	Neg	Neg
34	HCV	Neg	D+75	Neg	Neg
42	HHV 5	Neg	D+57	Neg	Neg
42	HCV	Neg	D+34	Neg	Neg
43	HCV	Neg	D0	Neg	Neg
44	HCV	Neg	D0	Neg	Neg

HHV: Human herpes virus; HCV: Hepatitis C.

**Supplementary Table 5: Patients with established post-transplant diagnosis of viral infection**

Patient	Virus	Recipient serology at D0	Donor serology	VirScan at D0 (enriched peptide)	Virscan at D+365 (enriched peptide)	Concordance
8	HHV 5	Neg	Pos	Neg (2)	Pos (22)	Yes
18	HHV 5	Neg	Pos	Neg (4)	Pos (29)	Yes
21	HHV 5	Neg	Pos	Neg (4)	Pos (19)	Yes
21	hMPV	-	-	Neg (0)	Neg (1)	No
32	HHV 5	Neg	Pos	Neg (0)	Pos (5)	Yes

HHV: Human herpes virus; hMPV: Human metapneumovirus.