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Hantavirus Disease Cluster Caused by Seoul Virus, Germany

Appendix

Appendix Table 1. Results of the hantavirus routine diagnostics performed in 8 expert laboratories in Europe*

Laboratory	Routine assay used	Result IgG	Result IgM	Interpretation made by the laboratory
A	Hantavirus Hantaan virus IgG/IgM EIA	pos	pos	acute hantavirus infection without typing
	Hantavirus Puumala virus IgG/IgM EIA	pos	pos	
B	Hantavirus-Mosaic 2 IgG and IgM IFA	dilution 1:10,000 HTNV	dilution 1:100 SEOV	no typing possible
C	cFRNT in house (IgG only)	PUUV (1:173), DOBV (1:147), HTNV (1:890), SEOV (1:1648)		evidence for SEOV infection
D	Reagen Puumala virus IgG/IgM	neg	neg	no hantavirus infection
E	In-house IFA Dobrava-Belgrade virus IgG/IgM	1:5,120	1:320	no typing possible
	In-house IFA Puumala virus IgG/IgM	1:320	< 1:20	
	In-house IFA Seoul virus IgG/IgM	1:5,120	1:80	
	In-house IFA Hantaan virus IgG/IgM	1:5,120	1:320	
F	Hantavirus DxSelect IgG/IgM EIA	pos (s/c ratio: 7.54)	pos (s/c ratio: 7.41)	acute hantavirus infection without typing
G	Eurasia Hantavirus pool 1 EIA	pos	pos	acute hantavirus infection without typing
H	Hantavirus profile 1 EIA	pos	pos	past DOBV infection

The serum sample was obtained from patient #3 approx. two months after complete recovery from his Seoul virus (SEOV) infection. cFRNT, chemiluminescence focus reduction neutralization assay; IFA, immunofluorescence assay; EIA, enzyme immunoassay; pos, positive; HTNV, Hantaan virus; PUUV, Puumala virus; DOBV, Dobrava-Belgrade virus; SEOV, Seoul virus
 Note: Although different screening assays were used, no single assay (except cFRNT) allowed a definitive typing. SEOV infection may be overseen if hantavirus screening is done only with a PUUV rapid assay (see laboratory D).
 Results were generated in the laboratories headed by Dres Baillot, Bohnert, Eis-Hübinger, Emmerich, Enders, Ganzenmüller, Maes, Schüttler and our own (alphabetical order, not corresponding with designation laboratory A-H)

Appendix Table 2. Results of hantavirus confirmation assays performed on a serum sample from patient 3 in the expert laboratories*

Laboratory	Test	recomLine HantaPlus IgG and IgM (Mikrogen)				
		PUUV	SNV	HTNV	DOBV	SEOV
A	IgG	+/-	-	+++	+++	+
	IgM	+++	++	+++	+++	++
B	IgG	+/-	-	++	++	+
	IgM	++	++	++	++	++
C	IgG	-	-	+	+	+
	IgM	+	+	+	+	+
D	IgG	+/-	-	++	++	+
	IgM	+	+	+	+	+/-
E	IgG	+/-	-	++	++	++
	IgM	++	++	++	++	++
F	IgG	+	-	+++	+++	++
	IgM	++	++	++	++	++
I	IgG	+/-	-	+++	+++	+

		<i>recomLine HantaPlus IgG and IgM (Mikrogen)</i>				
Laboratory	Test	PUUV	SNV	HTNV	DOBV	SEOV
	IgM	+++	++	+++	+++	+
		<i>Hantavirus Profil 1 IgG and IgM (Euroimmun)</i>				
Laboratory	Test	PUUV	SNV	HTNV	DOBV	SEOV
G	IgG	++	-	+++	+++	n.d.
	IgM	+/-	-	+/-	+/-	n.d.

*PUUV, Puumala virus; SNV, Sin Nombre virus; HTNV, Hantaan virus; DOBV, Dobrava-Belgrade virus; SEOV, Seoul virus

Note: All laboratories observed cross-reactivity even on PUUV and SNV nucleocapsid proteins in the IgM assay and less pronounced in the IgG-assay. The data clearly demonstrate, that SEOV cannot be identified as the cause of the SEOV infection.

Results were generated in the laboratories headed by Dres Baillot, Bohnert, Eis-Hübinger, Emmerich, Enders, Ganzenmüller, Maes, Schüttler and our own (alphabetical order, not corresponding with designation laboratory A-H).