Supplementary Table 1. *Clinical data of patients included in this study*

Age (year)	sex	Diagnosis	Disease-modifying treatment
67	F	NMOSD[a]	RTX
64	F	RRMS	RTX
52	F	Aquaporin-4 pos. NMOSD	RTX
50	M	NMOSD	RTX
56	F	NMOSD	RTX
28	M	MOG pos. NMOSD	RTX, MTX
33	F	RRMS	RTX
69	F	MOG pos. NMOSD	RTX
56	M	Aquaporin-4 pos. NMOSD	RTX
50	M	Aquaporin-4 pos. NMOSD	RTX
57	F	Aquaporin-4 pos. NMOSD	RTX, MTX
58	F	Aquaporin-4 pos. NMOSD	RTX
30	F	Aquaporin-4 pos. NMOSD	RTX
45	F	Aquaporin-4 pos. NMOSD	RTX
54	F	Aquaporin-4 pos. NMOSD	RTX
35	F	NMOSD	RTX
43	F	NMOSD	RTX
30	F	RRMS	RTX
35	M	RRMS	DMF
55	F	RRMS	DMF
33	M	RRMS	DMF
43	F	RRMS	DMF
60	F	RRMS	DMF
46	M	RRMS	DMF
52	F	RRMS	DMF
46	M	RRMS	DMF
37	M	RRMS	DMF
37	M	RRMS	ATZ
25	M	RRMS	ATZ
24	F	RRMS	ATZ

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36	F	RRMS	ATZ
61	M	RRMS	NTZ
50	M	RRMS	NTZ
25	M	RRMS	NTZ
47	F	RRMS	NTZ
33	F	RRMS	NTZ
36	M	RRMS	NTZ
47	F	RRMS	NTZ
46	F	RRMS	NTZ
29	F	RRMS	NTZ
62	F	RRMS	FTY
29	F	RRMS	FTY
41	F	RRMS	FTY
48	F	RRMS	FTY
34	M	RRMS	FTY
55	M	RRMS	FTY
44	F	RRMS	UNT
45	F	RRMS	UNT
37	F	RRMS	UNT
37	M	RRMS	UNT
36	F	RRMS	UNT
67	M	RRMS	UNT
47	F	RRMS	UNT
34	F	RRMS	UNT
20	M	RRMS	UNT
53	F	RRMS	UNT

Footnote to supplementary Table 1: [a] Abbreviations used in this table: DMF: dimethylfumarat; FTY: fingolimod; NTZ: natalizumab; ATZ: alemtuzumab; UNT: untreated; RTX: rituximab; MTX: methothrexat; NMOSD: neuromyelitis spectrum disoders; MOG: myelin oligodendrocyte glycoprotein; RRMS: relapsing-remitting multiple sclerosis

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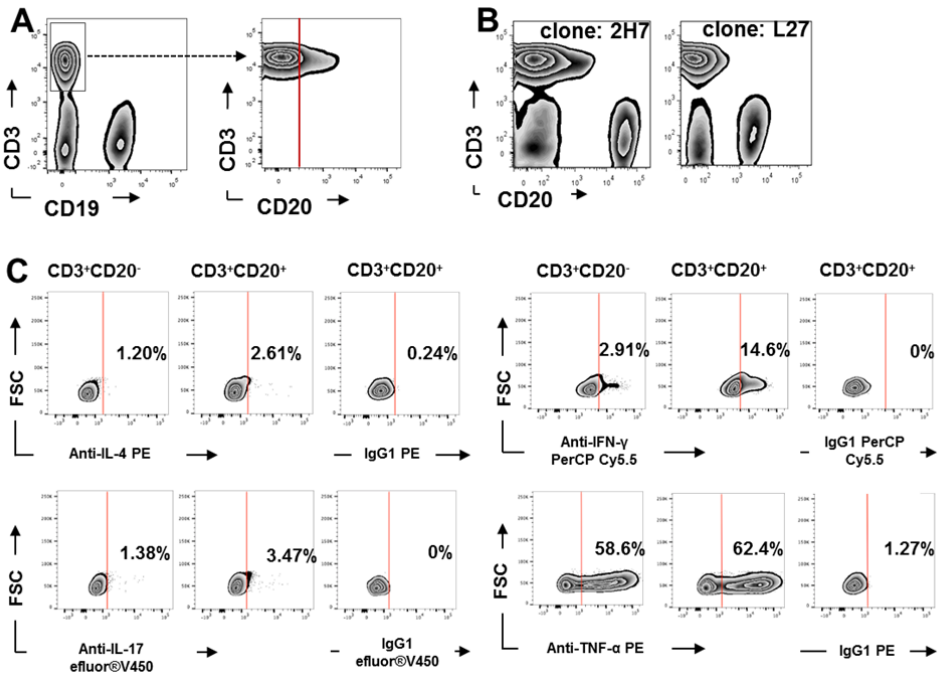
Supplementary Figure 1



Legend to supplementary Figure 1: *Strategy to identify CD3$^+$CD20$^+$ T cells and determination of cytokine production.* PBMC were triple stained for CD3, CD19, and CD20. First, CD3$^+$CD19$^-$ cells were gated and then CD20 expression on these cells was determined as described in materials and methods **(A)**. We noted that in our assays the anti-CD20 clone 2H7 gave a stronger staining and was more sensitive to identify these cells than the anti-CD20 clone L27 **(B)**. PBMC were simultaneously treated with PMA, iononmycin and brefeldin A for 4 hours. Then a multi-color, intracellular FACS was performed to determine expression of IL-4, IL-17, TNF-α and IFN-γ in comparison with isotype control. One representative experiment of 11 independent experiments is shown **(C)**.

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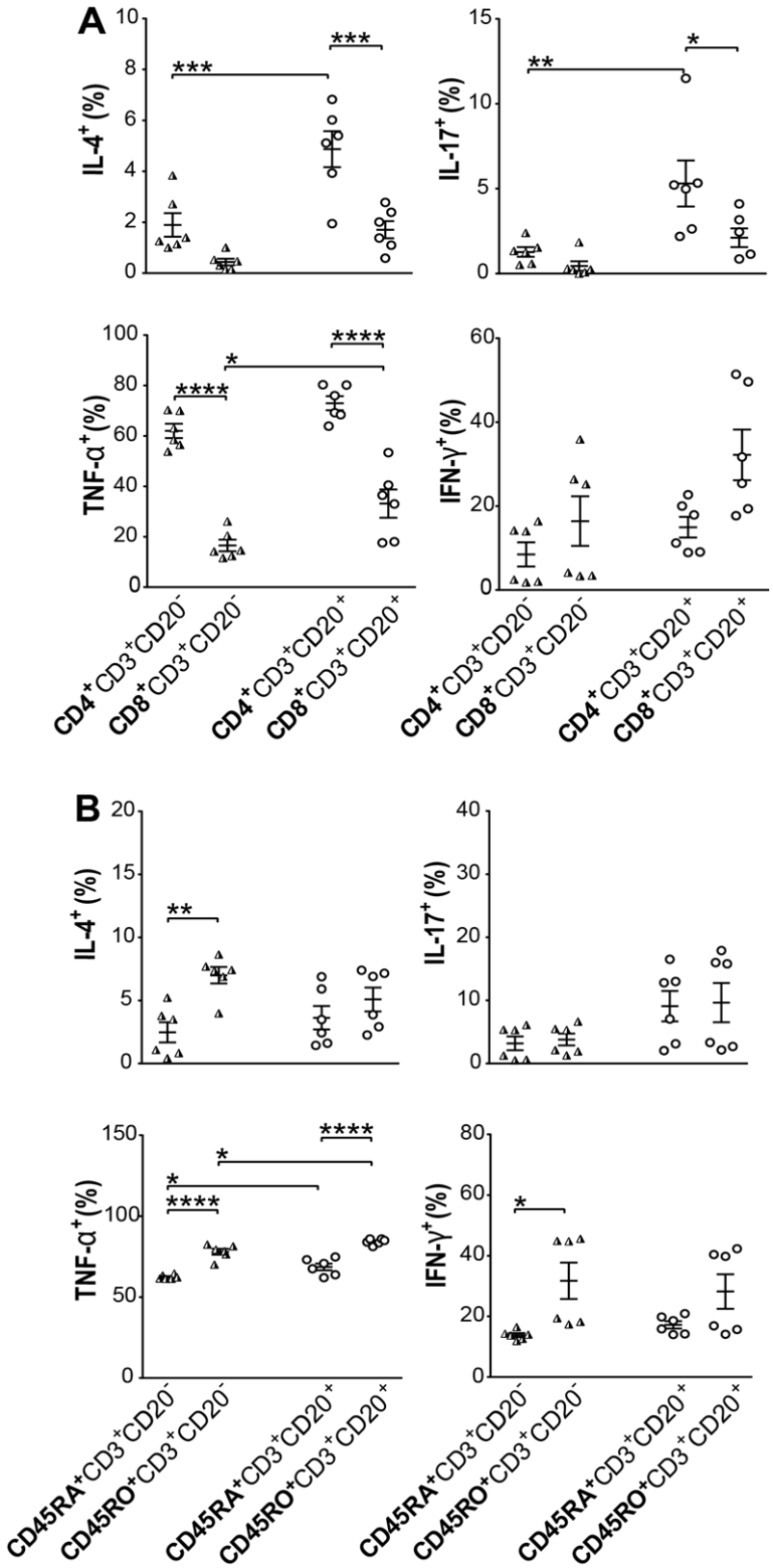
Supplementary Figure 2



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Legend to supplementary Figure 2. *Cytokine production by CD20 expressing T cell subsets.* PBMC were stimulated with PMA and ionomycin in the presence of brefeldin A for 4 hours and cytokine production was analyzed by flow cytometry. We distinguished subsets of $CD3^+CD20^-$ and $CD3^+CD20^+$ T cells based on the differential expression of CD4 or CD8 **(A)** and CD45RA or CD45 RO **(B)**. Data of 6 independent experiments from 6 different donors are shown (mean±SEM, one-way ANOVA and Bonferroni correction;*< *0.05,* **<*0.01,* ***<*0.001,* ****<*0.0001*).

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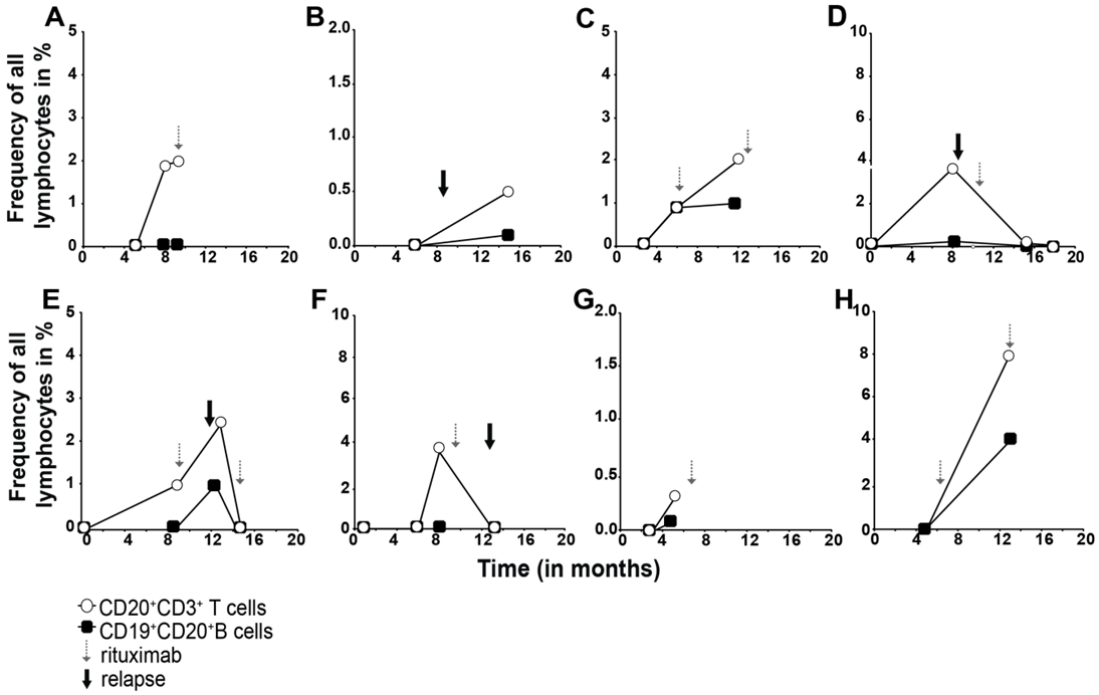
Supplementary Figure 3



Legend to supplementary Figure 3: *Frequency of $CD3^+CD20^+$ T cells and $CD20^+$ B cells in individual patients during therapy with rituximab.* Eight patients (MS:**D**; NMOSD: **A, B, C, E, F, G, H**) were followed longitudinally. The frequencies of $CD3^+CD20^+$ T cells and $CD19^+CD20^+$ B cells in blood were determined by flow cytometry. Time point zero represents the last rituximab infusion before start of the study.