

Supplementary Figures and Data

Table S1. Potency of BFP receptor binding and redirected T cell killing of tumor cells

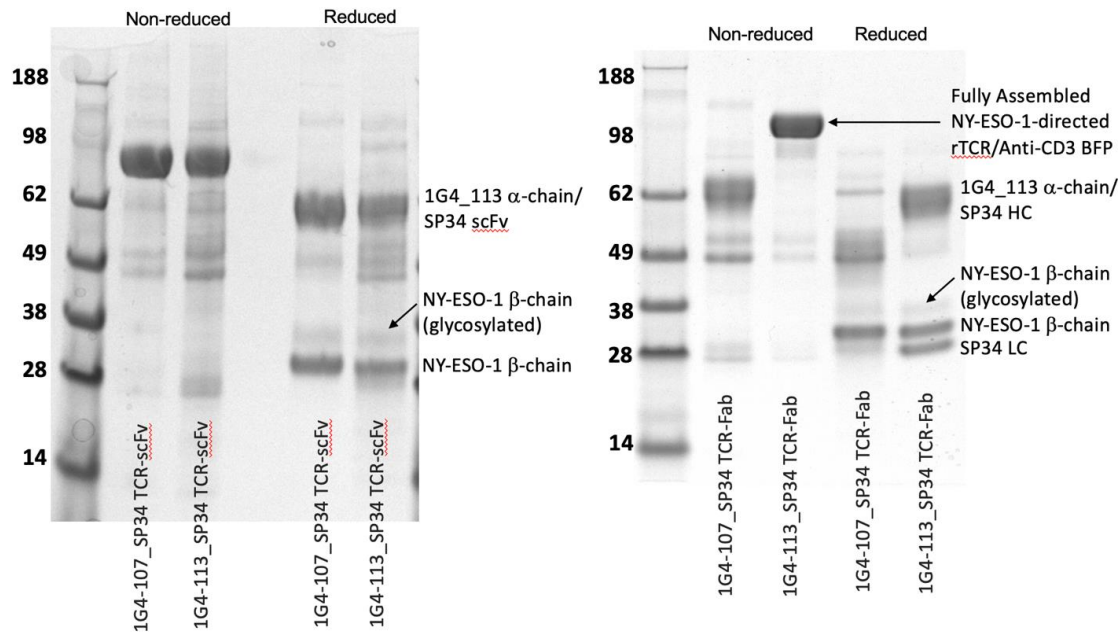
BFP	CD3 binding IC₅₀ of SP34-PE (nM)	HLA binding EC₅₀ (nM)	Tumor cell killing with non-activated T cells and exogenous antigen peptide EC₅₀ (nM)^a	Tumor cell killing with pre-activated T cells and endogenous antigen peptide EC₅₀ (nM)^b
NY-ESO-1 TCR-IgG	17	10	Inactive	n.d. ^c , Inactive
NY-ESO-1 TCR-Fab	130	1.4	0.1 (90%)	n.d., 20 (90%)
NY-ESO-1 TCR-scFv	230±30 ^d	2.5	7.0 (75%)	n.d., 200 (50%)
MAGE-A3 TCR-IgG	5.7	13	Inactive	Inactive, 0.6 (60%)
MAGE-A3 TCR-Fab	130	15	0.7 (100%)	0.7 (95%), 0.6 (100%)
MAGE-A3 TCR-scFv	110	14	2.1 (100%)	2.0 (95%), 1.0 (100%)

^aNY-ESO-1₁₅₇₋₁₆₅ SLLMWITQC or MAGE-A3₁₆₈₋₁₇₆ EVDPIGHLV peptide was pre-incubated for 2 hours on Saos-2 or HCT116 cells, respectively, prior to the addition of T cells and BFP.

^bT cells preactivated with anti-CD3/anti-CD28 and cultured with IL-2 were added with the BFPs onto HCT116 (left number) or A375 (right number) tumor cells. Numbers in parentheses indicates the percent tumor cell killing.

^cn.d. = not done

^dAverage of 2 separate experiments



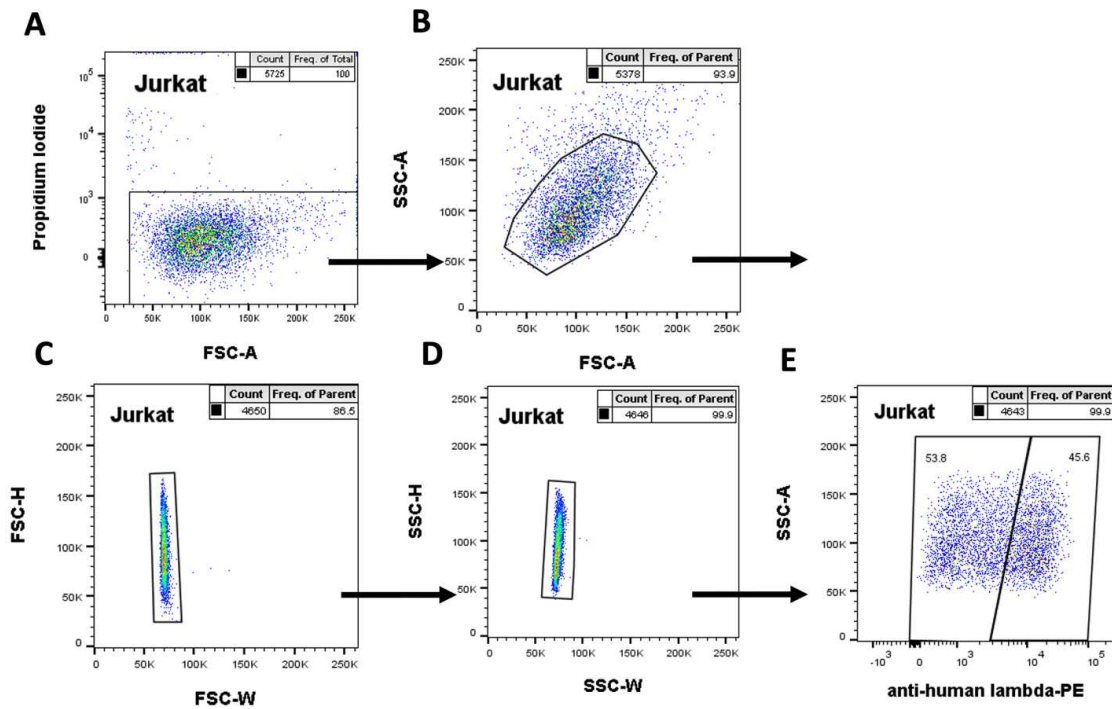


Figure S2. Gating Strategy for SP34-PE, TCR-IgG and TCR-Fab binding to CD3+ Jurkat cells. Jurkat cells were centrifuged and incubated for 45 minutes with rTCR/anti-CD3 BFPs. After washing, cells were stained with anti-human lambda-PE and incubated for 45 minutes. Propidium iodide was used as the live/dead cell discriminator. Acquisition was performed on a Becton Dickinson Fortessa using BD FACSDiva software v8.0.1. Analysis was performed using FlowJo v10.7.1. Cells were initially gated based on A: FSC-A vs Propidium Iodide to exclude dead cells. B: FSC-A vs SSC-A to identify cells based on light scattering. C and D: FSC-W vs FSC-H and SSC-W vs SSC-H for doublet discrimination. E: anti-human lambda-PE vs SSC-A was used to detect binding of the BFPs positivity while SP34-PE was directly labeled. Example shown uses the NY-ESO-1-directed TCR-IgG.

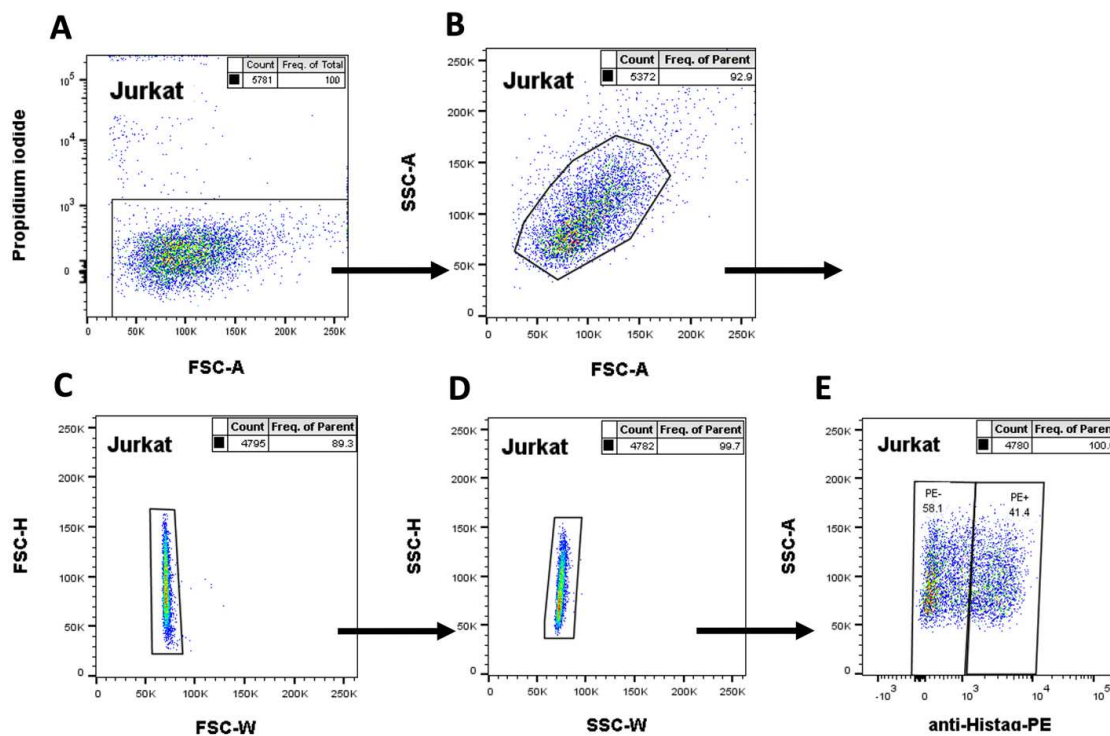


Figure S3. Gating Strategy for TCR-scFv binding to CD3+ Jurkat cells. Jurkat cells were centrifuged and incubated for 45 minutes with TCR BsAbs. After washing, cells were stained with anti-Histag-PE and incubated for 45 minutes. Propidium iodide was used as the live/dead cell discriminator. Acquisition was performed on a Becton Dickinson Fortessa using BD FACSDiva software v8.0.1. Analysis was performed using FlowJo v10.7.1. Cells were initially gated based on A: FSC-A vs Propidium Iodide to exclude dead cells. B: FSC-A vs SSC-A to identify the distribution of cells based on light scatter. C and D: FSC-W vs FSC-H and SSC-W vs SSC-H for doublet discrimination. E: anti-Histag-PE vs SSC-A for determination of positivity. Example shown uses the NY-ESO-1-directed TCR-scFv.

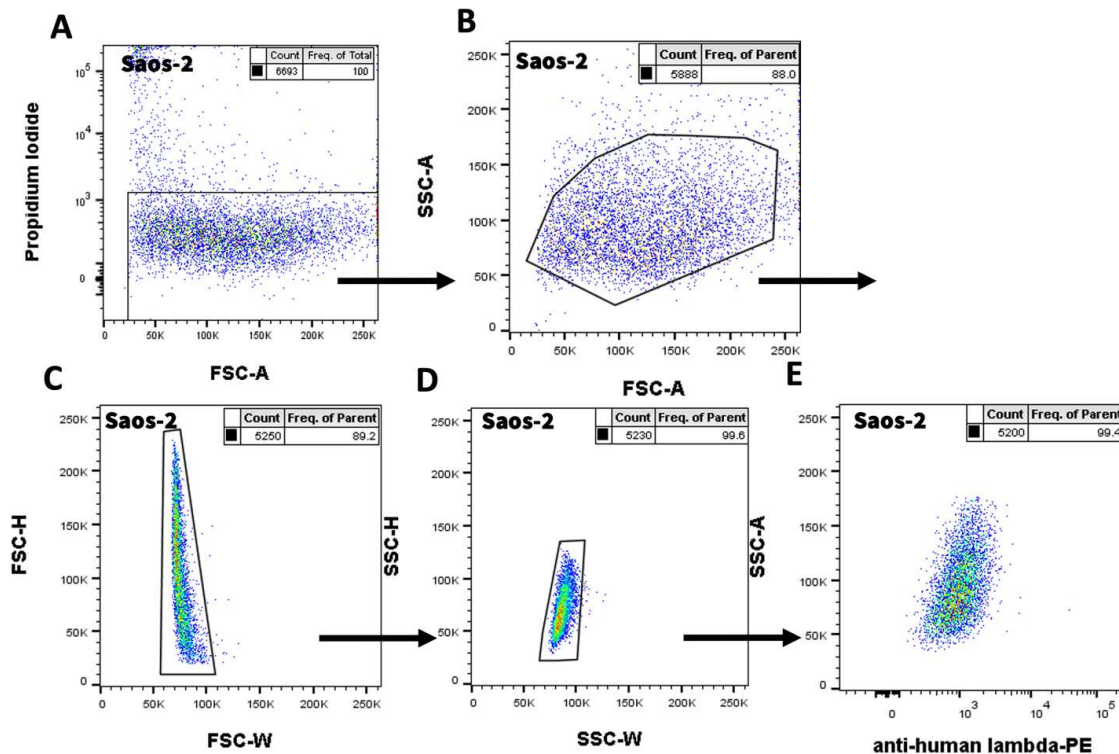


Figure S4. Gating Strategy for TCR-IgG and TCR-Fab binding to HLA-A2+ Saos-2 cells preloaded with NY-ESO-1157-165 SLLMWITQC peptide. Saos-2 cells were pulsed with peptide for 3 hrs., centrifuged and incubated for 45 minutes with TCR BsAbs. After washing, cells were stained with anti-human lambda-PE and incubated for 45 minutes. Propidium iodide was used as the live/dead discriminator. Acquisition was performed on a Becton Dickinson Fortessa using BD diva software v8.0.1. Analysis was performed using FlowJo v10.7.1. Cells were initially gated based on A: FSC-A vs Propidium Iodide to exclude dead cells. B: FSC-A vs SSC-A to identify the distribution of cells based on light scatter. C and D: FSC-H vs FSC-W and SSC-H vs SSC-W for doublet discrimination. E: anti-human lambda-PE vs SSC-A for determination of positivity for TCR-IgG and TCR-Fab BFPs.

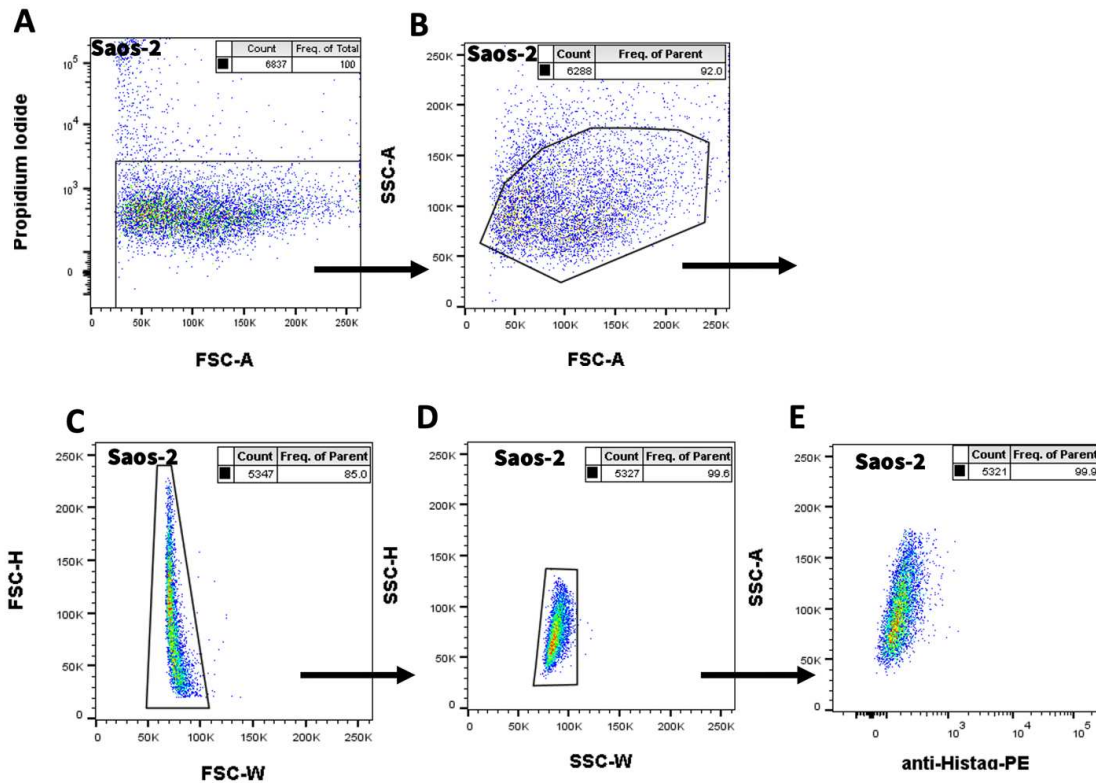


Figure S5. Gating Strategy for TCR-scFv binding to HLA-A2+ Saos-2 cells preloaded with NY-ESO-1157-165 SLLMWITQC peptide. Saos2 cells were pulsed with peptide for 3 hrs., centrifuged and incubated for 45 minutes with TCR BsAbs. After washing, cells were stained with anti-Histag-PE and incubated for 45 minutes. Propidium iodide was used as the live/dead discriminator. Acquisition was performed on a Becton Dickinson Fortessa using BD diva software v8.0.1. Analysis was performed using FlowJo v10.7.1. Cells were initially gated based on A: FSC-A vs Propidium Iodide to exclude dead cells. B: FSC-A vs SSC-A to identify the distribution of cells based on light scatter. C and D: FSC-H vs FSC-W and SSC-H vs SSC-W for doublet discrimination. E: anti-Histag-PE vs SSC-A for determination of positivity.

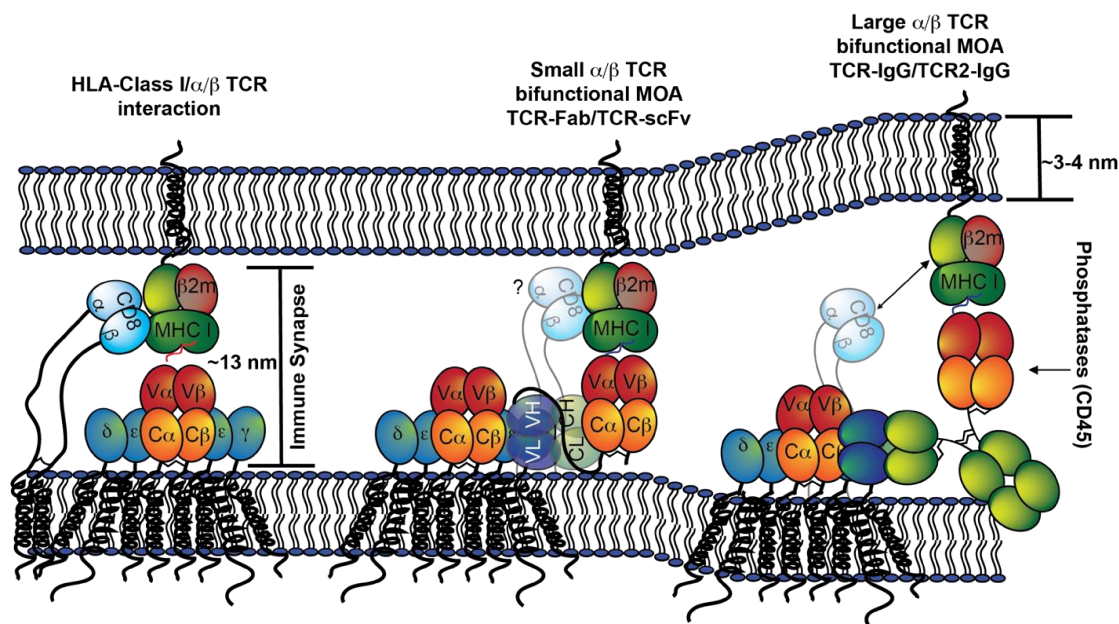


Figure S6. Schematic diagram depicting hypothetical challenges for the use of large and/or complex rTCR/Anti-CD3 BFPs. The natural TCR/MHC/CD8 complex formation is depicted on the left side of the diagram including the synaptic distance bridged by the TCR/MHC-peptide interaction as well as the CD8-coreceptor interaction. The rTCR/Anti-CD3 TCR-Fab and TCR-scFv molecules are depicted in the center of the diagram enabling similarly tight synapse formation, while the larger rTCR/Anti-CD3 BFPs exemplified by the TCR-IgG on the right-side of the diagram do not. The potential challenge of co-localizing the TCR-coreceptor CD8 is clear based on the diagram if the synaptic distance is too large.

Recombinant T cell Receptor/Anti-CD3 Bifunctional Protein Sequences

>MAGE-A3 TCR-scFv

KQEVTVQIPAAALSVPEGENLVLNCSFTDSAIYNLQWFRQDPGKGLTSLLYVVRPYQREQTSGRNLASLDKSSGRSTLYIAASQPGDSA
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NWVRQAPGKGLEWVARIRSKYNNYATYYADSVKDRFTISRDDSQSLLYLQMN
NLKTEDTAMYCVRHG
NFGNSYVSWFAYWGQGLTVTSAGGGGSGGGGSGGGGSAVVQESALTTSPGETVTLTCSRSTGAVTTSNYANWVQEKPDHLFTGLIGG
TNKRAPGVPARFSGSLIGDKAALTTGAQTEDEAIYFCALWYSNLWVFGGGTKLTVLGS
DYKDDDDKLEHHHHHHHH

GVTQTPRYLIKTRGQVTLTSCSPISGHRVSVWYQQTPGQGLQFLFEYFSETQRNKG
NFPGRFSGRQFSNSRSEMNVSTLELGD
SALYLCASSFNMATGQYFGPGTRLTVTE
DLKNVFPPEVAVFEPSEKAEISRTQKATLVCLATGFY
PHVELS
WVNGKEVHDGVC
TDPQLKEQPALNDSRYALSSRLRV
SATFWQDPRNHFRQCQVQFYGLSENDEWTQDRAKPV
TQIVSAEAWGRADC

>MAGE-A3 TCR-Fab

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VLDMRSMDFK
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LSCAASGFTFNTYAMN
NWVRQAPGKGLEWVARIRSKYNNYATYYADSVKDRFTISRDDSQSLLYLQMN
NLKTEDTAMYCVRHG
NFGNSYVSWFAYWGQGLTVTSAASTKGPSVFLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTS
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SALYLCASSFNMATGQYFGPGTRLTVTE
DLKNVFPPEVAVFEPSEKAEISRTQKATLVCLATGFY
PHVELS
WVNGKEVHDGVC
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SATFWQDPRNHFRQCQVQFYGLSENDEWTQDRAKPV
TQIVSAEAWGRADC

QAVVTQESALTTSPGETVTLTCSRSTGAVTTSNYANWVQEKPDHLFTGLIGG
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GQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTT
PSKQSNKYAASSYLSLTPAQWKS
HRSYSQCQVTHEGSTVEKTVAPTEC

>MAGE-A3 TCR-IgG

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VLDMRSMDFK
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SVMHEALHNNHYTQKLSLSLSPGK

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>NY-ESO-1 TCR-scFv

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>NY-ESO-1 TCR-Fab

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>NY-ESO-1/SP34 TCR-Fab-Fc

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PLKEQPALNDSRYALSRRLRVSATFWQDPRNHFRQCQVQFYGLSENDEWTQDRAKPVVTQIVSAEAWGRADC

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IYFCALWYNLWVFGGGTKLTVLQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSN
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>NY-ESO-1/SP34 TCR-Fab-IgG

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NSAVAWSNKSDFTCANAFNNSIIPEDTFFPSPESSCGGGGSGGGSGGGSGGGSEVQLVESGGGLVQPKGSLKLSCAASGFTFN
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NSAVAWSNKSDFTCANAFNNSIIPEDTFFPSPPEPKSCDKHTHTCPPCPAPEAAGGPSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHED
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LSLSPGK

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPNGYNVSRSTIEDFPLRLLSAAAPSQTSV
YFCASSYLNTGELFFGEGSRLTVLEDLKNVFPPEVAVFEPSPKAEISRITQKATLVCLATGFYPPHVELS WVVNGKEVHDGVCITDPO
PLKEQPALNDSRYALSRLRVSATFWQDPRNHFRQVQFYGLSENDEWTDRAKPVTVQIVSAEAWGRADC

QAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDHLFTGLIGGTNKRAPGVPARFSGSLIGDKAALTTGAQTEDEA
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NKYAASSYLSLTPQWKSHRYSYSCQVTHEGSTVEKTVAPTEC

>2TCR.1-Fab

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LDMRSMDFKSN SAVAWSNKSDFTCANAFNNSIIPEDTFFPSPESSCGGGGSGGGSGGGSGGGSEVTVQIPAAALSVPEGENLV
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APCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSVHTFFPAVLQSSGLYSLSSVTVPSSSLGKTYTCNVDPKPSNTKVDK
VESKYG

QAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDHLFTGLIGGTNKRAPGVPARFSGSLIGDKAALTTGAQTEDEA
IYFCALWYNLWVFGGGTKLTVLQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSN
NKYAASSYLSLTPQWKSHRYSYSCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPNGYNVSRSTIEDFPLRLLSAAAPSQTSV
YFCASSYLNTGELFFGEGSRLTVLEDLKNVFPPEVAVFEPSPKAEISRITQKATLVCLATGFYPPHVELS WVVNGKEVHDGVCITDPO
PLKEQPALNDSRYALSRLRVSATFWQDPRNHFRQVQFYGLSENDEWTDRAKPVTVQIVSAEAWGRADC

>2TCR.2-Fab

HHHHHHHHSQEVVTQIPAAALSVPEGENLVLNCSFTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYI
AASQPGDSATYLC AVRPLLDGTYIPTFGRGTS LIVHPYIQNPDPVAVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCV
LDMRSMDFKSN SAVAWSNKSDFTCANAFNNSIIPEDTFFPSPESSCGGGGSGGGSGGGSGGGSEVQLVESGGGLVQPKGSLK
SCAASGFTFN TYAMNWRQAPGKGLEWVARIRSKYNNYATYYADSVKDRFTISRDDSQSLLYLQMNLLKTEDTAMYYCVRHGNFNG
SYVSWFAYWGQGTTLVTVSAASTKGPSVFLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSVHTFFPAVLQSSGLYSLSS
VTVPSSSLGKTYTCNVDPKPSNTKVDKRVESKYGGGGSGGGSGGGSGGGSEVTVQIPAAALSVPEGENLVLNCSFTDSAIY
NLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSATYLC AVRPLLDGTYIPTFGRGTS LIVHPYIQ
NPDPVAVYQLRDSKSSDKFVCLFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKSN SAVAWSNKSDFTCANAFNNSIIPED
TFFPSPESSC

QAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDHLFTGLIGGTNKRAPGVPARFSGSLIGDKAALTTGAQTEDEA
IYFCALWYNLWVFGGGTKLTVLQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSN
NKYAASSYLSLTPQWKSHRYSYSCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPPNGYNVSRSTIEDFPLRLLSAAAPSQTSV
 YFCASSYLNTGELFFGEGSRLTVLEDLKNVFPPEVAVFEPSEKAEISRTQKATLVCLATGFYPPHVELSWVWNGKEVHDGVCTDPO
 PLKEQPALNDSRYALSRRLRVSATFWQDPRNHFRQVQFYGLSENDEWTQDRAKPVVTQIVSAEAWGRADC

>2TCR.3-Fab

HHHHHHHGGSEVQLVESGGGLVQPKGSLKLSAASGFTFNNTYAMNWVRQAPGKGLEWVARIRSKYNNYATYYADSVKDRFTISRDD
 SQSLLYLQMNLLKTEDTAMYCVRHGNFGNSYVSWFAYWQGTLVTVSAASTKGPSVFLAPCSRSTSESTAALGCLVKDYFPEPV
 TVSWNSGALTSGVHTFPAVLQSSGLYSLSVVTVPSSSLGKTYTCNVNKHPSNTKVDKRVEVKYGGGGGGGGGGGGGGGGGGGGGGGG
 QEVTVIQAALSVPEGENLVNCSFTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSAT
 YLCAVRPLLDGTYIPTFGRGTSLVHPIYIQNPDPVAVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKS
 NSAVAWSNKSDFTCANAFNNSIIPEDTFFPSPESPSSCGGG
 NLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSATYLCAVRPLLDGTYIPTFGRGTSLVHPIYIQ
 NPDPVAVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKSN SAVAWSNKSDFTCANAFNNSIIPEDTFFP
 SPSSC

QAVVTQESALTTSPGETVTLTCSRSTGAVTTSNYANWVQEKPDHLFTGLIGGNTKRAPGVPARFSGSLIGDKAALITGAQTEDEA
 IYFCALWYNSLWVFGGKTLTVLQPKAAPSVTLPFPSSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTTPSKQSN
 NKYAASSYLSLTPQWKSHRSYSQCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPPNGYNVSRSTIEDFPLRLLSAAAPSQTSV
 YFCASSYLNTGELFFGEGSRLTVLEDLKNVFPPEVAVFEPSEKAEISRTQKATLVCLATGFYPPHVELSWVWNGKEVHDGVCTDPO
 PLKEQPALNDSRYALSRRLRVSATFWQDPRNHFRQVQFYGLSENDEWTQDRAKPVVTQIVSAEAWGRADC

>2TCR.1-IgG

QEVTVIQAALSVPEGENLVNCSFTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSAT
 YLCAVRPLLDGTYIPTFGRGTSLVHPIYIQNPDPVAVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKS
 NSAVAWSNKSDFTCANAFNNSIIPEDTFFPSPESPSSCGGG
 QGTLVTVSAASTKGPSVFLAPSSKSTSGGTAALGCLVADYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSVVTVPSSSLG
 TQTYICNVNKHPSNTKVDKRVEPKSCDKTHTCPCPAPEAAGGPSVFLFPPKPKDTLMIISRTPEVTCVVVDVSHEDPEVKFNWYVD
 GVEVHNAKTKPREEQYSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRPQVYTLPPSREEMTKNQVSLV
 CLVKGFYPSDIAVEWESNGQPENNYKTPPVLDSDGSFFLYSLLTVLTDKSRWQQGNVSCSVMHEALHNHYTQKSLSLSPGK

DKTHTCPCPAPEAAGGPSVFLFPPKPKDTLMIISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYSTYRVVSVL
 TVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYK
 TTPPVLDSDGSFFLYSKLTVLTDKSRWQQGNVSCSVMHEALHNHYTQKSLSLSPGKGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG
 VPEGENLVNCSFTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSATYLCAVRPLLDG
 TYIPTFGRGTSLVHPIYIQNPDPVAVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKSN SAVAWSNKSD
 FTCANAFNNSIIPEDTFFPSPESPSSC

QAVVTQESALTTSPGETVTLTCSRSTGAVTTSNYANWVQEKPDHLFTGLIGGNTKRAPGVPARFSGSLIGDKAALITGAQTEDEA
 IYFCALWYNSLWVFGGKTLTVLQPKAAPSVTLPFPSSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTTPSKQSN
 NKYAASSYLSLTPQWKSHRSYSQCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPPNGYNVSRSTIEDFPLRLLSAAAPSQTSV
 YFCASSYLNTGELFFGEGSRLTVLEDLKNVFPPEVAVFEPSEKAEISRTQKATLVCLATGFYPPHVELSWVWNGKEVHDGVCTDPO
 PLKEQPALNDSRYALSRRLRVSATFWQDPRNHFRQVQFYGLSENDEWTQDRAKPVVTQIVSAEAWGRADC

>2TCR.2-IgG

EVQLVESGGGLVQPKGSLKLSAASGFTFNNTYAMNWVRQAPGKGLEWVARIRSKYNNYATYYADSVKDRFTISRDDSQSLLYLQMN
 NLKTEDTAMYCVRHGNFGNSYVSWFAYWQGTLVTVSAASTKGPSVFLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALT
 SGVHTFPAVLQSSGLYSLSVVTVPSSSLGKTYTCNVNKHPSNTKVDKRVEVKYGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG
 VPEGENLVNCSFTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSATYLCAVRPLLDG
 TYIPTFGRGTSLVHPIYIQNPDPVAVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKSN SAVAWSNKSD
 FTCANAFNNSIIPEDTFFPSPESPSSCDKHTCPCPAPEAAGGPSVFLFPPKPKDTLMIISRTPEVTCVVVDVSHEDPEVKFNWYVD
 GVEVHNAKTKPREEQYSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRPQVYTLPPSREEMTKNQVSLV
 CLVKGFYPSDIAVEWESNGQPENNYKTPPVLDSDGSFFLYSLLTVLTDKSRWQQGNVSCSVMHEALHNHYTQKSLSLSPGK

DKTHTCPCPAPEAAGGPSVFLFPPKPKDTLMIISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYSTYRVVSVL
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 TTPPVLDSDGSFFLYSKLTVLTDKSRWQQGNVSCSVMHEALHNHYTQKSLSLSPGKGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGGG
 VPEGENLVNCSFTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSATYLCAVRPLLDG

TYIPTFGRGTS LIVHPYIQNPDPVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKSNSAVAWSNKSD
 FT CANAFNNSI IPEDTFFPSPEPKSC

QAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDHLFTGLIGGTNKRAPGVPARFSGSLIGDKAALITGAQTEDEA
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 NKYAASSYLSLTPQWKS HRYSYSCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPNGYNVSRSTIEDFLRLLSAAAPSQTSV
 YFCASSYLNGTGFEGSRLTVLEDLKNVFPPEVAVFEPKAEISRTQKATLVCLATGFYPHVELSWVWNGKEVHDGVC TDPQ
 PLKEQPALNDSRYALSRLRVSATFWQDPRNHFRQCQVQFYGLSENDEWTQDRAKPVTVQIVSAEAWGRADC

>2TCR.3-IgG

EVQLVESGGGLVQPKGSLKLSCAASGFTFNTYAMNWVRQAPGKGLEWVARIRSKYNNYATYYADSVKDRFTISRDDSQSLLYLQMN
 NLKTEDTAMYCVRHGNFGNSYVSWFAYWGGTGLVTVSAASTKGPSVFLPAPCSRSTSESTAAALGCLVKDYFPEPVTVSWNSGALT
 SGVHTFPAVLQSSGLYSLSSVTVTPSSSLGKTYTCNVDPKPSNTKVDKRVESKYGGGGSGGGGSGGGGSGGGGSGQEVTPAALS
 VPEGENLVLNCSTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSATYLCVAVRPLLDG
 TYIPTFGRGTS LIVHPYIQNPDPVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKSNSAVAWSNKSD
 FT CANAFNNSI IPEDTFFPSPEPKSCDKHTHTCPPCPAPEAAGGPSVFLFPPKPKDTLMI SRTEVTCVVDVSHEDPEVKFNWYVD
 GVEVHNAKTKPREEQYQSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRRPVYVYTLPPSREEMTKNQVSLV
 CLVKGFPYPSDIAVEWESNGQPENNYKTTTPVLDSDGSFFLYSRLTVDKSRWQQGNVFCSCVMHEALHNHYTQKLSLSLSPGK

QEVTPAALSVP EGENLVLNCSTDSAIYNLQWFRQDPGKGLTSLLLITPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSAT
 YLCVAVRPLLDGTYIPTFGRGTS LIVHPYIQNPDPVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKS
 NSAVAWSNKSDFT CANAFNNSI IPEDTFFPSPEPKSCDKHTHTCPPCPAPEAAGGPSVFLFPPKPKDTLMI SRTEVTCVVDVSHED
 PEVKFNWYVDGVEVHNAKTKPREEQYQSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRRPVYVYTLPPSR
 EEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPVLDSDGSFFLYSRLTVDKSRWQQGNVFCSCVMHEALHNHYTQKLS
 SLSLSPGK

QAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDHLFTGLIGGTNKRAPGVPARFSGSLIGDKAALITGAQTEDEA
 IYFCALWYNSLWVFGGKTLTVLQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSN
 NKYAASSYLSLTPQWKS HRYSYSCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPNGYNVSRSTIEDFLRLLSAAAPSQTSV
 YFCASSYLNGTGFEGSRLTVLEDLKNVFPPEVAVFEPKAEISRTQKATLVCLATGFYPHVELSWVWNGKEVHDGVC TDPQ
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>2TCR.4-IgG

QEVTPAALSVP EGENLVLNCSTDSAIYNLQWFRQDPGKGLTSLLLISPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSAT
 YLCVAVRPLLDGTYIPTFGRGTS LIVHPYIQNPDPVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKS
 NSAVAWSNKSDFT CANAFNNSI IPEDTFFPSPEPKSCDKHTHTCPPCPAPEAAGGPSVFLFPPKPKDTLMI SRTEVTCVVDVSHED
 PEVKFNWYVDGVEVHNAKTKPREEQYQSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRRPVYVYTLPPSRE
 EMTKNQVSLVCLVKGFPYPSDIAVEWESNGQPENNYKTTTPVLDSDGSFFLYSRLTVDKSRWQQGNVFCSCVMHEALHNHYTQKLS
 LSPGKGGGGSGGGGSGGGGSGGGGSEVQLVESGGGLVQPKGSLKLSCAASGFTFNTYAMNWVRQAPGKGLEWVARIRSKYNNYATY
 YADSVKDRFTISRDDSQSLLYLQMN NLKTEDTAMYCVRHGNFGNSYVSWFAYWGGTGLVTVSAASTKGPSVFLPAPCSRSTSEST
 AALGCLVKDYFPEPVTVSWNSGALTS GVHTFPAVLQSSGLYSLSSVTVTPSSSLGKTYTCNVDPKPSNTKVDKRVESKYG

QEVTPAALSVP EGENLVLNCSTDSAIYNLQWFRQDPGKGLTSLLLITPWQREQTSGRNLASLDKSSGRSTLYIAASQPGDSAT
 YLCVAVRPLLDGTYIPTFGRGTS LIVHPYIQNPDPVYQLRDSKSSDKFVCLFTDFDSQINVSQSKSDSVYITDKCVLDMRSMDFKS
 NSAVAWSNKSDFT CANAFNNSI IPEDTFFPSPEPKSCDKHTHTCPPCPAPEAAGGPSVFLFPPKPKDTLMI SRTEVTCVVDVSHED
 PEVKFNWYVDGVEVHNAKTKPREEQYQSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRRPVYVYTLPPSR
 EEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPVLDSDGSFFLYSRLTVDKSRWQQGNVFCSCVMHEALHNHYTQKLS
 SLSLSPGK

QAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDHLFTGLIGGTNKRAPGVPARFSGSLIGDKAALITGAQTEDEA
 IYFCALWYNSLWVFGGKTLTVLQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSN
 NKYAASSYLSLTPQWKS HRYSYSCQVTHEGSTVEKTVAPTEC

GVTQTPKFQVLKGTGQSMTLQCAQDMNHEYMSWYRQDPGMGLRLIHYSVAIQTTDRGEVPNGYNVSRSTIEDFLRLLSAAAPSQTSV
 YFCASSYLNGTGFEGSRLTVLEDLKNVFPPEVAVFEPKAEISRTQKATLVCLATGFYPHVELSWVWNGKEVHDGVC TDPQ
 PLKEQPALNDSRYALSRLRVSATFWQDPRNHFRQCQVQFYGLSENDEWTQDRAKPVTVQIVSAEAWGRADC