Supplementary Information

Linear epitopes of SARS-CoV-2 spike protein elicit neutralizing antibodies in COVID-19 patients

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Materials and Methods

Peptide synthesis and conjugation with BSA

The N-terminal amidated peptides were synthesized by GL Biochem, Ltd. (Shanghai, China). Each peptide was individually conjugated with BSA using Sulfo-SMCC (Thermo Fisher Scientific, MA, USA) according to the manufacture's instruction. Briefly, BSA was activated by Sulfo-SMCC in a molar ratio of 1: 30, followed by dialysis in PBS buffer. The peptide with cysteine was added in a w/w ratio of 1:1 and incubated for 2 h, followed by dialysis in PBS to remove free peptides. A few conjugates were randomly selected for examination by SDS-PAGE. For the conjugates of biotin-BSA-peptide, before conjugation, BSA was labelled with biotin by using NHS-LC-Biotin reagent (Thermo Fisher Scientific, MA, USA) with a molar ratio of 1: 5, and then activated by Sulfo-SMCC.

Peptide microarray fabrication

The peptide-BSA conjugates as well as S1 protein, RBD protein and N protein of SARS-CoV-2, along with the negative (BSA) and positive controls (anti-Human IgG and IgM antibody), were printed in triplicate on PATH substrate slide (Grace Bio-Labs, Oregon, USA) to generate identical arrays in a 1 x 7 subarray format using Super Marathon printer (Arrayjet, UK). The microarrays were stored at -80°C until use.

Patients and samples

The Institutional Ethics Review Committee of Foshan Fourth Hospital, Foshan, China approved this study and the written informed consent was obtained from each patient. COVID-19 patients were hospitalized and received treatment in Foshan Forth hospital during the period from 2020-1-25 to 2020-3-8 with variable stay time (Supplementary Table 2). Serum from each patient was collected on the day of hospital discharge when the standard criteria were met according to Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 5), released by the National Health Commission & State Administration of Traditional Chinese Medicine. The basic criteria are the same with that in the Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia $(Trial Version 7)^1$. Briefly, the key points of the discharge criteria are: 1) Body temperature is back to normal for more than three days; 2) Respiratory symptoms improve obviously; 3) Pulmonary imaging shows obvious absorption of inflammation; 4) Nuclei acid tests negative twice consecutively on respiratory tract samples such as sputum and nasopharyngeal swabs (sampling interval being at least 24 hours). From 2020-2-28, standard criteria of discharge were modified by adding one item that nuclei acid tests should be negative on anal swab sample. Sera of the control group from Lung cancer patients and healthy donors were collected from Ruijin Hospital, Shanghai, China. All the sera were inactivated at 56 °C for 30 min and stored at -80°C until use.

Microarray-based serum analysis

A 7-chamber rubber gasket was mounted onto each slide to create individual chambers for the 7 identical subarrays. The microarray was used for serum profiling as described previously with minor modifications². Briefly, the arrays stored at -80°C were warmed to room temperature and then incubated in blocking buffer (3% BSA in 1×PBS buffer with 0.1% Tween 20) for 3 h. A total of 400 μ L of diluted sera or antibodies was incubated with each subarray for 2 h. The sera were diluted at 1:200 for most samples and for competition experiment, free peptides were added at a concentration of 0.25 mg/mL. For the enriched antibodies, 0.1-0.5 μ g antibodies were included in 400 μ L incubation buffer. The arrays were washed with 1×PBST and bound antibodies were detected by incubating with Cy3-conjugated goat anti-human IgG and Alexa Fluor 647-conjugated donkey anti-human IgM (Jackson ImmunoResearch, PA, USA), which were diluted for 1: 1,000 in 1×PBST. The incubation was carried out at room temperature for 1 h. The microarrays were then washed with 1×PBST and dried by centrifugation at room temperature and scanned by LuxScan 10K-A (CapitalBio Corporation, Beijing, China) with the parameters set as 95% laser power/ PMT 550 and 95% laser power/ PMT 480 for IgM and IgG, respectively. The fluorescent intensity was extracted by GenePix Pro 6.0 software (Molecular Devices, CA, USA).

Purification of epitope-specific antibodies

Depends on the availability, 200-500 µL serum from COVID-19 convalescent patient was two-fold diluted in 1×PBS and then pre-incubated with streptavidin beads to eliminate non-specific binding. For each epitope, 100 µg peptides conjugated with biotin-BSA were coated to 100 µL streptavidin magnetic beads (Invitrogen, MA, USA) in 1×PBS buffer at room temperature for 1 h. The protein-coated streptavidin beads were washed 4 times in 1×PBS containing 0.1% BSA, and incubated with the pre-cleaned serum in 1×PBS at 4°C for 4 h. The streptavidin beads were then washed 3 times in 1×PBS containing 0.1% BSA, and eluted with 0.2 M glycine, 1 mM EGTA, pH 2.2. Finally, the antibodies were neutralized with 1M Tris-HCl, pH8.0. The concentration of the purified antibody was monitored by silver staining.

Pseudotyped Virus Neutralization

The neutralization assay was performed as described³. Briefly, 293 T cells were cotransfected with expression vectors of pcDNA3.1-SARS-CoV-2-S (encoding SARS- CoV-2 S protein) and pNL4-3.luc.RE bearing the luciferase reporter-expressing HIV-1 backbone. The supernatants containing SARS-CoV-2 pseudotyped virus were collected 48 h post-transfection. Antibodies or isotype IgG control (Thermo Fisher Scientific, MA, USA) in DMEM supplemented with 10% fetal calf serum were incubated with pseudoviruses at 37°C for 1 h and then the mixtures were added to monolayer Huh-7 cells (10⁴ per well in 96-well plates). Twelve h after infection, culture medium was refreshed and then the cells were incubated for an additional 48 h. The luciferase activity was calculated for the detection of relative light units using the Bright-Glo Luciferase Assay System (Promega, WI, USA). Huh-7 cells were subsequently lysed with 50 μl lysis reagent (Promega, WI, USA), and 30 μl of the lysates were transferred to 96-well Costar flat-bottom luminometer plates (Corning Costar, MA, USA) for the detection of relative light units using the Firefly Luciferase Assay Kit (Promega, WI, USA) and an Ultra 384 luminometer (Tecan, Switzerland).

Data analysis and software

Signal Intensity was defined as the median of the foreground subtracted by the median of background for each spot and then averaged the triplicate spots for each peptide or protein. IgG and IgM data were analyzed separately. Pearson correlation coefficient between two proteins or indicators and the corresponding p value was calculated by SPSS software under the default parameters. Cluster analysis was performed by pheatmap package in R⁴. To calculate the response frequency of each epitope specific

antibody, mean signal + 3*SD of the control sera were used to set the threshold. The epitope map was generated by ImmunomeBrowser issued by IEDB (Epitope Prediction and Analysis Tools)⁵. Visualization of the structural details were processed by Pymol (<u>https://pymol.org/2/</u>).

References

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Supplementary Fig. 1. Peptide Design and microarray fabrication

Supplementary Fig. 1. Peptide design and microarray fabrication. a. Peptide design and conjugation with BSA through the cysteine on the N terminal. The numbers 201 and 192 indicates the peptides that were successfully synthesized and conjugated, respectively. b. layout of the peptide microarray. The image was from anti-BSA antibody incubation. Peptides were sequentially printed and the peptides for each row are indicated on the right. c. A representative merged image of one COVID-19 serum. IgG response is indicated as green, while IgM is indicated as red. **d-f.** Correlations between repeated spots of the same protein on the same array, repeats arrays and peptide groups with different concentrations.

a. Binding kinetics varies among different peptides and their corresponding serum antibodies



b. Competition of the binding by free peptides



Supplementary Fig. 2. Detection of the SARS-CoV-2 specific antibody responses by using the peptide microarray. a. Dynamic change of signal intensities for some representative peptides and S1 protein in different concentrations. b. Microarray results of the competition assays with the addition of free peptides to the sera. The serum used and the dilution are labeled above. The peptides used for competition are labeled on the left and the red arrows and white rectangles indicate the position of the corresponding peptides.



Supplementary Fig. 3. IgM responses against peptides derived from S protein. Heatmap of IgM antibody responses of 55 sera from COVID-19 convalescent patients and controls (Healthy donors and Lung cancer patients). Peptides that fully cover S protein were surveyed and S1 protein and RBD were included on the peptide microarray as controls. The peptides were sequentially arranged without clustering. FI, fluorescent intensity.



Supplementary Fig.4. Correlation analysis among antibody responses against S1 subunit derived epitopes and S1 protein. a-e. Correlations of IgG responses between two peptides, proteins or peptide and proteins. f. Summary of the correlations of IgG responses between representative peptides and S1 protein.



S2-16 776 KNTQEVFAQVKQ 787

Supplementary Fig.5. Cross-activity of anti-S2-82 antibodies. a. The structural position of S1-82 on S protein (PDB: 6xyb). **b.** IgM responses of S1-82 in COVID-19 patients (blue) and controls (yellow). c-f. correlations of IgG responses between S1-82 and other peptides. The red spots were samples with high IgG signals for S1-82. g. Sequence similarity among the indicated peptides with S1-82.

a. Probe the enriched antibodies on the peptide array

b. Layout of the peptide microarray V 2.0



C. Comparison of sera before and after depletion of epitope specific antibodies



Supplementary Fig.6. Epitope-specific antibody depletion from sera. a. Peptide microarray results for epitope-specific antibodies. Red arrows indicate the corresponding peptides. b. Layout of the new version of the peptide microarray with 0.3 mg/mL peptides printed. c. Representative images (left) and results (right) for comparison of sera between before and after depletion of epitope specific antibodies. The positions of the corresponding peptides labeled on the left that were used for depletion are indicated by arrows.

NO	Pentide ID	Sart Position	Amino acid sequence	End Position	Note
1	<u>S1-1</u>	1	MEVELVI L PLVS	12	Noto
2	S1-2	7	LLPLVSSQCVNL	18	
3	S1-3	13		24	
4	S1-4	19	TTRTQLPPAYTN	30	
5	S1-5	25	PPAYTNSFTRGV	36	
6	S1-6	31	SFTRGVYYPDKV	42	
7	S1-7	37	YYPDKVFRSSVL	48	
8	S1-8	43	FRSSVLHSTQDL	54	
9	S1-9	49	HSTQDLFLPFFS	60	
10	S1-10	55	FLPFFSNVTWFH	66	Insoluble
11	S1-11	61	NVTWFHAIHVSG	72	
12	S1-12	67	AIHVSGTNGTKR	78	
13	S1-13	73	TNGTKRFDNPVL	84	
14	S1-14	79	FDNPVLPFNDGV	90	
15	S1-15	85	PFNDGVYFASTE	96	
16	S1-16	91	YFASTEKSNIIR	102	
17	S1-17	97	KSNIIRGWIFGT	108	
18	S1-18	103	GWIFGTTLDSKT	114	
19	S1-19	109	TLDSKTQSLLIV	120	
20	S1-20	115	QSLLIVNNATNV	126	
21	S1-21	121	NNATNVVIKVCE	132	
22	S1-22	127	VIKVCEFQFCND	138	
23	S1-23	133	FQFCNDPFLGVY	144	
24	S1-24	139	PFLGVYYHKNNK	150	
25	S1-25	145	YHKNNKSWMESE	156	
26	S1-26	151	SWMESEFRVYSS	162	
27	S1-27	157	FRVYSSANNCIF	168	
28	S1-28	163	ANNCIFEYVSQP	1/4	
29	S1-29	169	EYVSQPFLMDLE	180	
30	S1-30	175		186	
31	51-31	181		192	Incolubio
32	S1-32 S1-32	107		196	Insoluble
33	S1-33 S1 34	193		204	
34	S1-34 S1 25	205		210	
36	S1-36	203		210	
37	S1-30 S1-37	211		222	
38	S1-38	223		234	
39	S1-39	229		240	
40	S1-40	235	ITREQUITATION	246	Insoluble
41	S1-41	241	LLALHRSYLTPG	252	
42	S1-42	247	SYLTPGDSSSGW	258	
43	S1-43	253	DSSSGWTAGAAA	264	
44	S1-44	259	TAGAAAYYVGYL	270	
45	S1-45	265	YYVGYLQPRTFL	276	
46	S1-46	271	QPRTFLLKYNEN	282	Insoluble
47	S1-47	277	LKYNENGTITDA	288	
48	S1-48	283	GTITDAVDCALD	294	
49	S1-49	289	VDCALDPLSETK	300	
50	S1-50	295	PLSETKCTLKSF	306	
51	S1-51	301	CTLKSFTVEKGI	312	
52	S1-52	307	TVEKGIYQTSNF	318	
53	S1-53	313	YQISNFRVQPIE	324	
54	51-54	319	RVQPTESIVRFP	330	
55	51-55	325		330	
50 57	S1-30 S1 57	331		342	
57	S1-57 S1 59	342		340 354	
50	S1-50 S1 50	343		360	
59	S1-59 S1-60	355	PKPISNCVADVS	366	
61	S1-61	361	CVADYSVI YNSA	372	
62	S1-62	367	VI YNSASESTEK	378	
63	S1-63	373	SESTEKCYGVSP	384	
64	S1-64	379	CYGVSPTKI NDI	390	
65	S1-65	385	TKLNDLCFTNVY	396	
66	S1-66	391	CFTNVYADSFVI	402	
67	S1-67	397	ADSFVIRGDEVR	408	
68	S1-68	403	RGDEVRQIAPGQ	414	
69	S1-69	409	QIAPGQTGKIAD	420	
70	S1-70	415	TGKIADYNYKLP	426	
71	S1-71	421	YNYKLPDDFTGC	432	

72	S1-72	427	DDFTGCVIAWNS	438	Failure for synthesis
73	S1-73	433	VIAWNSNNLDSK	444	,
74	S1-74	439	NNLDSKVGGNYN	450	
75	S1-75	445	VGGNYNYLYRLF	456	Insoluble
76	S1-76	451	YLYRLFRKSNLK	462	
77	S1-77	457	RKSNLKPFERDI	468	
78	S1-78	463	PFERDISTEIYQ	474	
79	S1-79	469	STEIYQAGSTPC	480	
80	S1-80	475	AGSTPCNGVEGF	486	
81	S1-81	481	NGVEGENCYEPL	492	
82	S1-82	487	NCYFPLQSYGFQ	498	
83	S1-83	493	QSYGFQPTNGVG	504	
84	S1-84	499	PTNGVGYQPYRV	510	
85	S1-85	505	YQPYRVVVLSFE	516	
86	S1-86	511	VVLSFELLHAPA	522	
87	S1-87	517	LLHAPATVCGPK	528	
88	S1-88	523	TVCGPKKSTNLV	534	
89	S1-89	529	KSTNLVKNKCVN	540	
90	S1-90	535	KNKCVNFNFNGL	546	
91	S1-91	541	FNFNGLTGTGVL	552	
92	S1-92	547	TGTGVLTESNKK	558	
93	S1-93	553	TESNKKFLPFQQ	564	
94	S1-94	559	FLPFQQFGRDIA	570	
95	S1-95	565	FGRDIADTTDAV	576	
96	S1-96	571	DTTDAVRDPQTL	582	
97	S1-97	577	RDPQTLEILDIT	588	
98	S1-98	583	EILDITPCSFGG	594	
99	S1-99	589	PCSFGGVSVITP	600	
100	S1-100	595	VSVITPGTNTSN	606	
101	S1-101	601	GTNTSNQVAVLY	612	
102	S1-102	607	QVAVLYQDVNCT	618	
103	S1-103	613	QDVNCTEVPVAI	624	
104	S1-104	619	EVPVAIHADQLT	630	
105	S1-105	625	HADQLTPTWRVY	636	
106	S1-106	631	PTWRVYSTGSNV	642	
107	S1-107	637	STGSNVFQTRAG	648	Insoluble
108	S1-108	643	FQTRAGCLIGAE	654	
109	S1-109	649	CLIGAEHVNNSY	660	
110	S1-110	655	HVNNSYECDIPI	666	
111	S1-111	661	ECDIPIGAGICA	672	
112	S1-112	667	GAGICASYQIQI	678	
113	S1-113	673	SIQIQINSPRRA	684	
114	51-114	679	NSPRRARGGGGS	685	la seluble
115	52-1	080		697	
110	52-2	608		703	Failure for synthesis
117	52-3 \$2-4	704	SVAVSNINSIAID	709	
110	52-4 52-5	704		713	
120	S2-6	716		727	Failure for synthesis
120	S2-7	772	VTTEILEVSMTK	733	Tallare for synthesis
122	S2-8	728	PVSMTKTSVDCT	739	
123	S2-9	734	TSVDCTMYICGD	745	Failure for synthesis
124	S2-10	740	MYICGDSTECSN	751	
125	S2-10	746	STECSNLLLQYG	757	
126	S2-12	752	LLLQYGSFCTQL	763	
127	S2-13	758	SFCTQLNRALTG	769	Insoluble
128	S2-14	764	NRALTGIAVEQD	775	
129	S2-15	770	IAVEQDKNTQEV	781	
130	S2-16	776	KNTQEVFAQVKQ	787	
131	S2-17	782	FAQVKQIYKTPP	793	
132	S2-18	788	IYKTPPIKDFGG	799	
133	S2-19	794	IKDFGGFNFSQI	805	
134	S2-20	800	FNFSQILPDPSK	811	
135	S2-21	806	LPDPSKPSKRSF	817	
136	S2-22	812	PSKRSFIEDLLF	823	
137	S2-23	818	IEDLLFNKVTLA	829	
138	S2-24	824	NKVTLADAGFIK	835	Failure for synthesis
139	S2-25	830	DAGFIKQYGDCL	841	
140	S2-26	836	QYGDCLGDIAAR	847	
141	S2-27	842	GDIAARDLICAQ	853	
142	S2-28	848	DLICAQKFNGLT	859	
143	S2-29	854	KFNGLTVLPPLL	865	
144	S2-30	860	VLPPLLTDEMIA	871	
145	S2-31	866	TDEMIAQYTSAL	877	

146 82:20 0YTSALLAGTIT 883 147 52:33 878 LACTISQUTFG 889 148 52:34 884 SQWTFGAGAALQ 885 149 52:35 890 AGALOPFANQ 901 150 52:36 896 IPFAMOMAYREN 907 151 52:37 902 MARRENGIGVTQ 913 152 52:38 908 GICUTONUYEN 919 153 52:44 922 OKLINAGRISS 937 154 52:44 922 ORILINAGRISS 937 155 52:44 942 ORILINAGRISSTAS 943 156 52:44 944 ALCKUOPVNON 955 158 52:44 944 ALCKUOPVNON 955 159 52:44 942 LVKALSISTAS 967 161 52:47 962 LVKALSISTAS 967 166 52:41 968 SIVADILSRLD 985 166 52:41							
147 S2-33 B78 LACTITEGWTFG B89 148 S2-35 B80 AGAALQIPFAMQ B91 150 S2-36 B86 IPFAMQMAWRFN 907 151 S2-37 902 MAYRFNGIGVTO 913 152 S2-38 908 GIVTONVYEN 919 153 S2-39 914 NVLYENQKLIAN 925 154 S2-40 920 ORLIANOFINSAI 931 155 S2-41 926 OFNSAIGKODS 937 156 S2-44 944 ALCKLQOVNON 955 158 S2-44 944 ALCKLQOVNON 957 158 S2-44 944 ALCKLQOVNON 957 159 S2-46 954 ALCKLQOVNON 957 161 S2-46 954 ALCKLQOVNON 957 163 S2-46 954 CORNERISVIND 957 164 S2-50 960 LISRLDKVERAEV 981 165<	-	146	S2-32	872	OYTSALLAGTIT	883	
146 32.3.3 80.4 EGWITTED/ANDO 805 146 32.3.5 80.6 AFANGIANDO 805 146 32.3.6 80.6 AFANGIANDO 805 151 52.3.7 90.2 MAYRENGIGVTO 913 152 S2.3.8 90.8 GICVTONULVEN 919 153 S2.4.9 92.0 QKLIANOFNSAI 931 156 S2.4.1 92.6 QFNSAIGRIQDS 937 156 S2.4.4 94.4 ALCKLODV/NON 955 158 S2.4.4 94.4 ALCKLODV/NON 955 160 S2.4.4 94.4 ALCKLODV/NON 955 161 S2.4.7 962 LVKOLSNFGAI 973 162 S2.4.8 98.8 SNFGAISVLND 979 163 S2.4.1 98.0 LSRLDVEAEV 981 164 S2.4.5 98.0 LSRLDVEAEV 981 166 S2.4.5 10.0 GO3 10.3 <tr< td=""><th></th><td>147</td><td>62.02</td><td>070</td><td></td><td>000</td><td></td></tr<>		147	62.02	070		000	
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150 S2.36 896 IPFAMQMAYRFN 907 151 S2.37 902 MAYRFNGGVTQ 913 152 S2.38 904 NUYENRGGVTQ 913 155 S2.40 920 QKLIANQFNSAI 931 156 S2.41 926 QFNSAIGRUQDS 937 156 S2.42 932 GKNQDSLSTAS 943 157 S2.43 938 LSTSASLGKLQ 949 158 S2.44 944 ALCKLQDV/NQN 955 159 S2.45 950 D/VNMQALSNFGAI 973 161 S2.47 962 L/VAQLSNFGAI 973 162 S2.48 968 SNFGAISVLND 979 163 S2.42 966 TQTVTQULRA 911 164 S2.42 966 TQTVTQULRA 1001 167 S2.42 966 TQTVTQULRA 1015 168 S2.42 966 TQTVTQULRA 1016 169 <th></th> <td>149</td> <td>S2-35</td> <td>890</td> <td>AGAALQIPFAMQ</td> <td>901</td> <td></td>		149	S2-35	890	AGAALQIPFAMQ	901	
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151 32-37 302 MATRINGIOUD 913 152 32-33 914 NVLYENQLLAN 925 153 32-33 914 NVLYENQLLAN 935 154 32-40 920 ORLIANOPINSAL 931 155 S2-41 926 ORVIGUESISTAS 940 156 S2-42 933 CHOROSISTAS 940 157 S2-43 934 LISTASALCKLA 946 158 S2-44 946 ALKOLVALA 956 159 S2-44 946 ALKOLVALA 957 150 S2-47 982 ALKOLVALA 973 151 S2-48 946 ALKOLVALA 973 152 S2-49 974 SSVLNDISRLD 979 152 S2-49 974 SSVLNDISRLD 976 156 S2-52 992 OIDRLITGRLOS 1033 157 S2-56 1010 OULRARIASALAT 1027 170		100	02 00	000		010	
152 S2-38 906 GIGVTORVLYEN 919 153 S2-39 914 NVLYENOKLIAN 925 154 S2-40 920 OKLIANQFNSAI 931 156 S2-41 926 GFNSAIGKIQDS 937 156 S2-42 932 GKIQDSLSTAS 943 157 S2-43 938 LSSTASLGKLQ 949 158 S2-44 944 ALCKLQDV/NON 985 159 S2-45 950 DV/NORAQALNT 961 160 S2-40 974 ASVLNDLSRLD 973 162 S2-41 966 AQALINTL/KQLS 967 164 S2-50 980 ILSRLDAVEAEV 991 166 S2-51 980 GICRASLOTYT 1009 168 S2-54 1004 LOTYTQQLIRA 1015 169 S2-55 1010 QUIRAKERSA 1021 170 S2-66 1016 AELRASANLAAT 1022 171 S2-65 1010 QUIRAKERSA 1033 172		151	52-37	902	MAYRENGIGVIQ	913	
153 S2-39 914 NVL/YENQKUAN 925 154 S2-40 920 QKULNOPNSA 931 155 S2-41 926 GKUDSLSSTAS 943 157 S2-43 938 LSSTASLIGKLO 949 158 S2-44 944 ALGKLODV/NON 955 159 S2-45 950 DV/NQNAQALNT 961 161 S2-46 956 AQALNTU/KQLS 967 162 S2-48 966 SNFGAISSVIND 979 163 S2-49 974 SSVLNDILSRLD 985 164 S2-60 960 ILSRLDVFAEV 991 165 S2-51 992 GIDRLIGRLOS 1003 166 S2-52 992 GIDRLIGRLOS 1003 167 S2-53 1010 GULRALERAS 1021 170 S2-56 1010 GULRALERAS 1021 171 S2-57 1022 KMSECVLG2SKR 1033 177 S2-58 1024 KMSECVLG2SKR 1033 177		152	S2-38	908	GIGVTQNVLYEN	919	
154 S2-40 920 OKLIANGENSAH 931 155 S2-41 932 OKIQORLSSTAS 943 157 S2-43 938 LCSTASALGKLO 949 158 S2-44 944 ALCKLQDVWQN 955 159 S2-46 950 DVVNONAQALNT 961 160 S2-47 962 LVKQLSSNFGAL 973 161 S2-47 962 LVKQLSSNFGAL 973 162 S2-48 966 SNFGALSSVLND 979 163 S2-49 974 SSVLNDILSRLD 9965 164 S2-50 986 KKLEVQIDRLI 997 166 S2-52 992 OIDRUTGRLOS 1003 167 S2-56 1016 ALLANTKMECV 1033 172 S2-56 1014 LGORKNPDFCGK 1045 174 S2-60 1044 VDFCGKGVPLMSK 1051 175 S2-61 1046 GYHLMMSPQSAP 1057		153	S2-39	914	NVLYENQKLIAN	925	
165 S2-41 328 OPINSAIGNIZIOS 337 166 S2-42 332 GRIODSLISTAS 943 167 S2-43 933 LISSTASLIGKLO 949 169 S2-46 955 AQUADUANTUKOLS 967 161 S2-47 955 AQUADUANTUKOLS 967 161 S2-47 955 AQUADUANTUKOLS 967 163 S2-46 955 AQUADUANTUKOLS 967 163 S2-46 955 AQUADUANTUKOLS 979 164 S2-50 992 ORELIDINCE 997 165 S2-51 992 ORELIDINCE 997 166 S2-52 992 ORELIDINCE 997 167 S2-54 1004 LOTVYTOLIRA 1005 168 S2-55 1004 LOTVYTOLIRA 1027 171 S2-56 1016 ACIRAPANILART 1027 173 S2-61 1026 ANIASANILART 1027		154	S2-40	020		031	
150 52-41 926 UPRSAIGNUDS 937 156 52-42 938 LSSTASLIGKLQ 949 157 52-43 938 LSSTASLIGKLQ 949 158 52-44 944 ALLGKLQDV/NON 955 159 52-45 950 DV/NONACALNT 961 160 52-46 956 AQALINTUKOLS 967 161 52-47 962 LVKOLSSIFGAI 973 162 52-48 966 SINFOALSKUD 979 163 52-49 960 ILSRLDVFAEV 991 166 52-50 960 ILSRLDVFAEV 991 166 52-51 1004 LQTYTQUR 1015 169 52-55 1010 QUIRAERAS 1021 171 52-56 1010 QUIRAERAS 1039 172 52-58 1022 ANLATKMSECV 1033 173 52-59 1034 LGOSKRVPCGK 1045 174		104	02-40	320		331	
156 S2-42 932 GKIQDSLSSTAS 943 157 S2-43 933 LSSTASALGKLO 949 158 S2-44 944 ALGKLODV/NON 955 159 S2-45 950 DV/NONAAALINT 961 160 S2-46 956 AQALNTL/KOLS 967 161 S2-47 962 LVKQLSSNFGAI 973 162 S2-48 968 SNFGAISSVLND 979 163 S2-49 974 SSVLNDILSRLD 985 164 S2-50 980 ILSRLDKVEAEV 991 166 S2-52 992 OIGRUTGRLQS 1003 167 S2-53 998 TGRLQSLOTYT 1009 168 S2-54 1004 LQTVYTQUIRA 1015 170 S2-56 1016 AQLANTMARKAT 1021 171 S2-56 1016 AQLANTMARKAT 1033 172 S2-58 1026 KMSECVLOGSKR 1045 174 S2-60 1040 VPCGKGYNLMS 1061 177		155	52-41	926	QFNSAIGKIQDS	937	
157 S2-43 938 LSSTASALGKLQ 949 158 S2-44 944 ALGKLQDVVADN 965 159 S2-46 950 DVVNQNAQAQLNT 961 160 S2-46 956 AQALNTUKQLS 967 161 S2-47 962 LVKQLSSNFGAI 973 162 S2-48 968 SNFCAISSVLND 979 163 S2-49 974 SSVLNDLSRLD 985 164 S2-50 980 ILSRLDVEAEV 991 165 S2-51 982 OIRLITGRLQS 1003 166 S2-52 992 OIRLITGRLQS 1003 167 S2-53 1004 LQTVTQUIA 1015 168 S2-54 1004 LGQSRVDFCGK 1039 170 S2-56 1016 AEIRASANLANT 1027 171 S2-57 1022 ANLATKMSECV 1039 173 S2-69 1034 LGOSRVDFCGK 1039 174 S2-61 1046 GYLHMSFPOSAP 1057 176		156	S2-42	932	GKIQDSLSSTAS	943	
158 S2-44 944 ALCRICIDVVNON 955 159 S2-46 956 AQALNTT VKOLS 967 161 S2-47 952 LVKOLSSNFGAI 973 162 S2-48 974 SSVLNDILSRLD 995 163 S2-49 974 SSVLNDILSRLD 997 164 S2-50 986 KLSRLDKVEAEV 991 165 S2-51 986 KLSRLDKVEAEV 991 166 S2-52 992 OIDRLITGRLQS 1003 167 S2-53 986 TGRLQSLCTVY 1003 168 S2-54 1004 LGTVYTQQLIRA 1015 170 S2-56 1010 QUIRAEIRASNLAAT 1027 171 S2-57 1022 ANLAATKINSECV 1033 173 S2-69 1034 LGQSKRVDFCGK 1045 174 S2-66 1070 AQENNFTTAPAI 1061 177 S2-65 1070 AQENNFTTAPAI 1083		157	S2-43	938	I SSTASALGKLQ	949	
130 32-44 34-4 ALGREDUNCE 361 180 32-46 360 DV/VNONAAALNT 961 181 32-46 366 AQALINTLYKOLS 967 182 32-48 968 SNFGAISSVLND 973 183 S2-49 974 SSVLNDILSRLD 985 184 S2-50 980 ILSRLDKVEAEV 991 185 S2-51 986 KVEAEVOIDRLI 997 186 S2-55 1010 QUIRALTIGRLQS 1003 187 S2-56 1016 AEIRASANLAR 1021 170 S2-56 1016 AEIRASANLAR 1021 171 S2-56 1016 AEIRASANLAR 1021 172 S2-56 1034 LGOSRVDFCGK 1045 174 S2-66 1040 VDFCGRGYHLMS 1061 175 S2-61 1046 GYHLMSFPQSAP 1067 176 S2-62 1052 FPOSAPHGVFL 1063 <t< td=""><th></th><td>150</td><td>S2 44</td><td>044</td><td></td><td>055</td><td></td></t<>		150	S2 44	044		055	
159 S2-45 950 DVVNUNAALALNI 961 160 S2-46 966 AQALNTLYKQLS 973 162 S2-44 962 LVKQLSSNFGAI 973 163 S2-49 974 SSVLNDILSRLD 995 164 S2-50 980 ILSRLDKVEAEV 991 165 S2-51 986 KVEAEVQIDRLI 997 166 S2-52 992 QIDRLITGRLOS 1003 167 S2-53 998 TGRLOSLOTYT 1009 168 S2-54 1004 LQTVYTOQURA 1015 170 S2-56 1016 AELRASANLAAT 1027 171 S2-57 1022 KMSECVLGOSKR 1033 172 S2-58 1024 KMSECVLGOSKR 1035 173 S2-59 1034 LGOSKRVDFCGK 1045 174 S2-60 1052 FPOSAPHGVFL 1063 177 S2-65 1070 AQENNFTHAPI 1081 <t< td=""><th></th><td>100</td><td>32-44</td><td>944</td><td>ALGREQDVVNQN</td><td>900</td><td></td></t<>		100	32-44	944	ALGREQDVVNQN	900	
160 S2-46 956 AQALMTLVKQLS 967 161 S2-47 962 LVKQLSSNFGAI 973 163 S2-48 968 SNFGAISSVLND 979 164 S2-50 980 ILSRLDKVEAEV 991 165 S2-51 986 RVKAEVOIDRU 997 166 S2-52 992 OIDRUTGRIQS 1003 167 S2-53 998 TGRUQSLOTYVT 1009 168 S2-54 1004 LQTYVTQQLIRA 1015 170 S2-66 1016 AEIRASANLAAT 1027 171 S2-57 1022 ANLAATKMSECV 1033 172 S2-68 1028 KMSECVLGQSKR 1049 173 S2-69 1034 LGQSKRVDFCGK 1045 174 S2-64 1046 GYHUMSFPQSAP 1057 175 S2-64 1068 HGVVFLNTVPN 1063 176 S2-65 1070 AQEKNFTTAPAI 1087		159	S2-45	950	DVVNQNAQALNI	961	
161 S2-47 962 LVKQLSSNFGAI 973 163 S2-49 974 SSVLNDUSRLD 985 164 S2-50 980 LISRLDKVEAEV 991 165 S2-51 986 KVEAEVOIDRLI 997 166 S2-52 992 OIRLITGRIOS 1003 167 S2-53 998 TGRUGSLOTYT 1009 168 S2-55 1010 QUIRAAEIRAS 1021 170 S2-56 1016 AEIRASANLAAT 1027 171 S2-56 1028 KMSECVLGQSKR 1033 172 S2-68 1028 KMSECVLGQSKR 1036 174 S2-60 1040 VDFCGKGYHLMS 1067 176 S2-62 1052 FPOSAPHGVFL 1063 177 S2-65 1070 AQEKNTTAPAI 1081 180 S2-66 1076 TTAPAICHDCKK 1087 178 S2-66 1076 TAPAICHDCKK 1083 <t< td=""><th></th><td>160</td><td>S2-46</td><td>956</td><td>AQALNTLVKQLS</td><td>967</td><td></td></t<>		160	S2-46	956	AQALNTLVKQLS	967	
162 S2-48 968 SNFGAISSVLND 979 163 S2-49 974 SSVLNDILSRLD 985 164 S2-50 980 ILSRLDKVEAEV 991 165 S2-51 986 ILSRLDKVEAEV 991 166 S2-52 922 OIDRLTGRLQS 1003 167 S2-63 996 TGRLGSLGTVT 1009 168 S2-54 1004 LQTVVTQQLIRA 1015 169 S2-55 1010 QUIRALEIRASINLAT 1027 171 S2-56 1034 LGOSKRVDFCGK 1045 174 S2-69 1034 LGOSKRVDFCGK 1045 175 S2-61 1046 GYHLMSFPQSAP 1057 176 S2-62 1052 FPQSAPEGVPL 1063 177 S2-63 1068 HGVVFLHUTYP 1067 178 S2-64 1064 HGVVFLHUTYP 1063 179 S2-65 1070 ADEKNFTTPAPAI 1067		161	S2-47	962	I VKOLSSNEGAL	973	
112 32-49 974 SSVLNDILSRLD 975 1164 32-50 980 ILSRLDKVEAEV 991 1165 S2-51 996 KVEAEVOIDRLI 997 1166 S2-52 992 OIDRLITGRLQS 1003 1167 S2-53 998 TGRLQSLOTYUT 1009 1168 S2-54 1004 LQTYVTQUIRA 1015 1169 S2-55 1010 QUIRAEIRAS 1021 1170 S2-56 1016 AEIRASANLAAT 1021 1171 S2-57 1022 ANLATKMSECV 1033 1172 S2-58 1028 KMSECVLGOSKR 1033 1173 S2-61 1040 VDFCGKGYHLMS 1057 1175 S2-61 1052 FPOSAPHGVFL 1063 1177 S2-63 1052 FPOSAPHGVFL 1063 1178 S2-64 1076 ATAPAICHOGKA 1087 1180 S2-77 1082 CHOGKAHFPREG 1099		160	S2 49	069		070	
163 S2-49 9/4 SSVLNDLSRLD 985 164 S2-50 980 ILSRLDKVEAEV 991 166 S2-52 992 QIDRLITGRLQS 1003 167 S2-53 998 TGRLQSLQTYVT 1009 168 S2-54 1004 LQTVYTQUIRA 1015 170 S2-56 1016 AEIRASANLAAT 1027 171 S2-57 1022 ANLAATKINSECV 1033 172 S2-58 1028 KMSECVLGGKR 1039 173 S2-69 1034 LGGSKRVDFCKR 1057 176 S2-61 1046 CYHLMSFPGSAP 1057 177 S2-63 1058 HGVVFLHVTVP 1069 177 S2-64 1066 HVTVVPADEKNF 1075 178 S2-64 1068 HFPREQVFL 1069 180 S2-66 1070 ADEKNFVERG 1093 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-74 1124 GNCDVVGINV 1123 <td< td=""><th></th><td>102</td><td>32-40</td><td>900</td><td>SINFGAISSVLIND</td><td>979</td><td></td></td<>		102	32-40	900	SINFGAISSVLIND	979	
164 S2-50 980 LLSRLDKVEAEV 991 166 S2-51 992 QIRLITGRLQS 1003 167 S2-53 998 TGRLQSLOTVLT 1009 188 S2-54 1004 LQTVTQULRA 1015 189 S2-55 1010 QUIRAEIRAS 1021 170 S2-56 1016 AEIRASANLAT 1027 171 S2-56 1028 KMSECVLGOSK 1033 172 S2-58 1028 KMSECVLGOSK 1045 174 S2-60 1046 GYHLMSFPOSAP 1051 175 S2-61 1046 GYHLMSFPOSAP 1051 176 S2-62 1052 FPOSAPHGVFL 1063 177 S2-63 1058 HGVVFLHVTVP 1069 178 S2-64 1064 HVTVPAQEKNF 1075 179 S2-66 1070 AQENNTTAPAI 1081 180 S2-72 1102 CHOCKAHPREG 1093 181 S2-73 1106 QRNFYEPOIT 1117 18		163	S2-49	974	SSVLNDILSRLD	985	
166 S2-51 986 KVEAEVQIDRLI 997 166 S2-52 992 OIRLITGRUGS 1003 167 S2-53 998 TGRUOSLOTYVT 1009 168 S2-54 1004 LQTVTQUIRA 1015 169 S2-55 1010 QUIRATERAS 1021 170 S2-56 1016 AEIRASANLAAT 1027 171 S2-57 1022 ANLATKINSECV 1033 172 S2-58 1034 LGOSKRUPFCGK 1045 174 S2-60 1046 VUPCGRGYHLMS 1057 175 S2-61 1046 GYHLMSFPQSAP 1067 176 S2-62 1058 HGVFLHVTVP 1068 178 S2-64 1064 HVTVPADEKNF 1077 178 S2-66 1076 TAPAICHOGKA 1087 180 S2-76 1082 CHOGKAHPPRE 1099 181 S2-76 1100 THWFVTGNIFVE 1111		164	S2-50	980	ILSRLDKVEAEV	991	
106 S2.62 992 OIDRUITGRUGS 1003 167 S2.63 998 TGRUGSLAF 1003 168 S2.64 1004 LQTV/TQUIRA 1015 169 S2.65 1010 QUIRALTIGRUSS 1027 171 S2.66 1016 AEIRASAILAAT 1027 171 S2.65 1034 LGOSKRVDFCCK 1039 173 S2.69 1034 LGOSKRVDFCCK 1045 174 S2.60 1040 VDFCRGYHLMS 1051 175 S2.61 1046 GYHLMSFPQSAP 1051 176 S2.62 1052 FPOSAPHGVFL 1063 177 S2.63 1058 HGVFLHVTVP 1069 178 S2.64 1064 HVYPYPACEKNF 1075 179 S2.65 1070 AQENNTTAPAI 1081 180 S2.67 1082 CHOCKAHPREG 1093 181 S2.72 1110 THVFVTORNFYE 1111		165	S2-51	986	KVEAEVOIDRI I	997	
166 52-52 392 CURLINGUS 1003 167 S2-53 998 TGRUGSLOTYT 1009 168 S2-54 1004 LQTYTQUIRA 1015 169 S2-55 1010 QUIRALERAS 1021 170 S2-56 1016 AERASANLAAT 1027 171 S2-57 1022 ANLAATKMSECV 1033 172 S2-58 1034 LGOSKRVDFCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1051 175 S2-61 1046 GYHLMSFPQSAP 1067 176 S2-64 1064 HVTVPADEKNYP 1069 177 S2-65 1070 AOEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHOBKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-71 1106 CRNFVEPQIITT 1117		100	62 57	000		1002	
167 S2-53 998 TGRLQSLQ1YV1 1009 168 S2-54 1004 LQTVYTQUIRA 1015 169 S2-55 1010 QQLIRAAEIRAS 1021 170 S2-56 1016 AEIRASANLAAT 1027 171 S2-57 1022 ANLAATKMSECV 1033 172 S2-58 1028 KMSECVLGQSKR 1039 173 S2-59 1034 LGQSKRVDFCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1051 175 S2-61 1046 GYHLMSFPQSAP 1057 176 S2-62 1052 FPQSAPHGVVFL 1063 177 S2-63 1058 HGVVFLHVTVP 1069 178 S2-64 1064 HVTYVPAQEKNF 1075 179 S2-65 1070 AQENTTAPAI 1081 180 S2-70 1082 CHOCKAHFPREG 1093 182 S2-74 1122 PQIIITT 1111 186 S2-75 1130 GIVNTYVPL 1141		100	52-52	992	QIDELLIGELQS	1003	
168 S2-54 1004 LQTYVTQQLIRA 1015 170 S2-55 1016 AEIRASANLAAT 1027 171 S2-57 1022 ANLAATKIMSECV 1033 172 S2-58 1024 ANLAATKIMSECV 1033 173 S2-59 1034 LGOSKRVDFCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1061 175 S2-61 1046 GYHLMSFPQSAP 1067 176 S2-62 1052 FPQSAPHGVVFL 1063 177 S2-65 1070 AQEKNFTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHOCKAHFPREG 1099 183 S2-68 1088 HFPREGVFVSNG 1099 184 S2-70 1100 THWFVGRNFYET 1105 184 S2-71 1106 QRIFYEPQIITT 1111 185 S2-74 1124 GNCDVVIGIVNN 1135 <th></th> <td>167</td> <td>S2-53</td> <td>998</td> <td>TGRLQSLQTYVT</td> <td>1009</td> <td></td>		167	S2-53	998	TGRLQSLQTYVT	1009	
169 S2-55 1010 QQLIRAAEIRAS 1021 170 S2-56 1016 AEIRASANLAAT 1027 171 S2-57 1022 ANLAATKMSECV 1033 172 S2-58 1028 KMSECVLGQSKR 1034 174 S2-59 1034 LGQSKRVDPCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1051 176 S2-61 1046 GYHLMSFPOSAP 1069 177 S2-63 1058 HGVVFLHYVP 1069 178 S2-64 1064 HYTYPADEKNF 1075 179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-67 1082 CHOGKAHFPREG 1093 182 S2-68 1068 HFPRE/VFVSNG 1099 183 S2-69 1040 VFVSNGTHWFVT 1105 184 S2-71 1106 CRNFYEPQIITT 1111 185 S2-71 1122 PQILITDNTFVS 1123		168	S2-54	1004	LQTYVTQQLIRA	1015	
135 12.5 10.10 CELENSALLAAT 1027 171 S2.55 1016 AEIRASANLAAT 1027 171 S2.56 1022 ANLAATKMSECV 1033 172 S2.58 1028 KMSECVLGQSKR 1045 174 S2.460 1040 VDFCGKGYHLMS 1051 175 S2.61 1046 GYHLMSPOSAP 1057 176 S2.62 1052 FPQSAPHGVVFL 1063 177 S2.64 1064 HUTYVPAQEKNF 1075 179 S2.66 1076 TTAPAICHDGKA 1087 180 S2.67 1082 CHOCKAHFTAPAI 1086 181 S2.67 1082 CHOCKAHFTAPAI 1099 183 S2.69 1094 VFVSNGTHWFVT 1105 184 S2.70 1100 THWFVTORNEYE 1111 185 S2.71 1106 QRNFYEPOINT 1117 186 S2.75 1130 IGVIVNNTYDPL 1141 <th></th> <td>169</td> <td>\$2-55</td> <td>1010</td> <td></td> <td>1021</td> <td></td>		169	\$2-55	1010		1021	
170 S2-36 1010 AERKSARUATI 1027 171 S2-57 1022 ANLAATKMSECV 1033 172 S2-58 1028 KMSECVLGQSKR 1039 173 S2-59 1034 LGQSKRVDFCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1051 175 S2-61 1046 GYHLMSFPQSAP 1063 177 S2-62 1052 FPQSAPHGWVFL 1069 178 S2-64 1064 HVTVYPAQEKNF 1075 179 S2-66 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1081 181 S2-67 1082 CHOGKAHFPREG 1093 182 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-71 1106 QRNFYEPQIITT 1111 185 S2-71 1106 QRNFYEPQIITT 1111 186 S2-77 1112 PQIITDNTFVS 1123 187 S2-76 1130 IGIVNNTVVDPL 1141		170	02 55	1010		1021	
171 S2-57 1022 ANLAATKMSECV 1033 172 S2-58 1028 KMSECVLGQSKR 1039 173 S2-59 1034 LGQSKRVDFCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1051 175 S2-61 1052 FPQSAPHGVVFL 1063 177 S2-63 1058 HGVVFL/VTVP 1069 178 S2-64 1064 HVTVVPAQEKNF 1075 179 S2-66 1070 AQEKNFTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-71 1100 THVFVPQITNNFYE 1111 185 S2-71 1100 GRNFYPEROITT 1123 187 S2-73 1112 POIITTDNTFVS 1123 188 S2-74 1124 GNCDVVIGIVNN 1135 Fa		170	52-56	1016	AEIRASANLAAT	1027	
172 S2-58 1028 KMSECVLGOSKR 1039 173 S2-59 1034 LGOSKRVDFCGK 1045 174 S2-60 1040 VDFCGKGYHLMS 1051 176 S2-62 1052 FPCSAPHGVFL 1063 177 S2-63 1058 HGVVFLHVTVVP 1069 178 S2-64 1064 HVTVVPAQEKNF 1075 179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTORNFYE 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1130 IGIVNNTYVDPL 1141 190 S2-76 1130 IGIVNNTYVDPL 1141 191 S2-77 1142 QPELDSFKEELD 1153		171	S2-57	1022	ANLAATKMSECV	1033	
173 \$2.59 1034 LGQSKRVDFCGK 1045 174 \$2.40 1040 VDFCGKGYHLMS 1051 175 \$2.42 1052 FPQSAPHGVVFL 1063 176 \$2.42 1052 FPQSAPHGVVFL 1069 177 \$2.463 1064 HVTYVPAQEKNF 1075 178 \$2.464 1064 HVTYVPAQEKNF 1081 180 \$2.466 1076 TTAPAICHDGKA 1087 181 \$2.67 1082 CHDGKAHFPREG 1093 182 \$2.468 1084 HFVFCGVFVSNG 1099 183 \$2.69 1094 VFVSNGTHWFVT 1105 184 \$2.70 1100 THWFVTQNPYE 1111 185 \$2.71 1106 QRNFYEPQITT 1117 186 \$2.72 1112 POIITTDNTFVS 1133 187 \$2.73 1118 DNTFVSGNCDVV 1129 188 \$2.74 1124 GNCDVUGIVNN 1135 Failure for synthesis 190 \$2.775 1136 TVYDPLQPELD		172	S2-58	1028	KMSECVLGQSKR	1039	
173 32:39 10:34 EduS/R(V) CSR 1043 174 S2:40 10:46 GYHLMSFPQSAP 1051 176 S2:41 10:46 GYHLMSFPQSAP 1063 177 S2:43 10:58 HGVVFLHVTVP 10:69 178 S2:44 10:64 HVTYVPAQEKNF 1075 179 S2:45 10:76 TTAPAICHOGKA 10:81 180 S2:46 10:76 TTAPAICHOGKA 10:87 181 S2:467 10:82 CHOCKAHFPREG 10:93 182 S2:48 10:84 HFPREGVFVSNG 10:99 183 S2:70 11:00 THWFVTQRNFYE 11:11 186 S2:71 11:06 QRNFYEPQUITT 11:11 186 S2:72 11:12 PQIITTDNTFVS 11:23 187 S2:73 11:18 DNTFVSGNCDVV 11:29 188 S2:75 11:30 TVYDPLQELDS 11:47 190 S2:76 11:36 TVYDPLQELDS 11:47 191 S2:77 11:42 QPELDSFKEELD		172	S2 50	1024		1045	
174 S2-80 1040 VDFCGRGYHLMS 1051 175 S2-62 1052 FPQSAPHGVVFL 1063 177 S2-63 1058 HGVVFLVTVP 1069 178 S2-64 1064 HVTYVPAQEKNF 1075 179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTORNFVE 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-72 1113 DNTFVSGNCOVV 1135 Failure for synthesis 189 S2-75 1130 IG/VNTVYDPL 1141 190 S2-76 1136 TVYDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH <th></th> <td>175</td> <td>32-39</td> <td>1034</td> <td></td> <td>1045</td> <td></td>		175	32-39	1034		1045	
175 S2-61 1046 GYHLMSPQSAP 1057 176 S2-62 1052 FPQSAPHGVVFL 1063 177 S2-63 1058 HGVVFLHVTYVP 1069 178 S2-64 1064 HVTYVPAQEKNF 1075 179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHOGKA 1087 181 S2-66 1076 TTAPAICHOGKA 1099 182 S2-68 1088 HFPREGVFVSING 1099 183 S2-69 1094 VFVSNGTHWFVT 1111 186 S2-71 1106 QRNFVEDQIITT 1111 185 S2-71 1106 QRNFVEDQIITT 1111 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCOV 1129 188 S2-76 1136 TVYDPLQPELDS 1147 190 S2-76 1136 TVYDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153		174	S2-60	1040	VDFCGKGYHLMS	1051	
176 S2-62 1052 FPQSAPHGV/FL 1063 177 S2-63 1058 HGVVFLHVTY/P 1069 178 S2-64 1064 HVTYVPAQENF 1075 179 S2-65 1070 AQEKNFTAPAI 1081 180 S2-66 1076 TTAPAICHOKKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQNIFYE 1111 185 S2-71 1106 QRNFYEPQIITT 1112 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDV 1123 188 S2-74 1124 GNCDVUGIVNN 1135 189 S2-75 1130 IGIVNNTV7DPL 1141 190 S2-76 1138 TYDPLQPELDS 1147 191 S2-77 1142 OPELDSFKEELD 1153 <tr< td=""><th></th><td>175</td><td>S2-61</td><td>1046</td><td>GYHLMSFPQSAP</td><td>1057</td><td></td></tr<>		175	S2-61	1046	GYHLMSFPQSAP	1057	
177 S2-63 1026 HGVVFLHVTYVP 1069 178 S2-64 1064 HVTYVPAQEKNF 1075 179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1081 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQRNFYE 1111 185 S2-71 1106 QRNFVEQUITT 1117 186 S2-72 1112 POIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVGIVN 1135 Failure for synthesis 190 S2-75 1130 IGIVNNTVPDLOPELDS 1141 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1165 194 S2-80 1160 TSPDVDLQEIDS 1141 195 S2-81 1166 LGDISGINASV		176	S2-62	1052	FPQSAPHGVVFI	1063	
177 \$2-63 1056 HGVVFLINTTVP 1069 178 \$2-64 1064 HVTVPAQENF 1075 179 \$2-65 1070 AQEKNFTTAPAI 1081 180 \$2-66 1076 TTAPAICHDGKA 1087 181 \$2-67 1082 CHOGKAHFPREG 1093 182 \$2-68 1088 HFPREGVEVSNG 1099 183 \$2-69 1094 VFVSNGTHWFVT 1105 184 \$2-70 1100 THWFVTQRNFYE 1111 185 \$2-71 1106 QRNFYEPQIITT 1117 186 \$2-72 1112 PQIITTDNTFVS 1123 187 \$2-73 1118 DNTFVSGNCDVV 1129 188 \$2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 189 \$2-75 1130 IGVNNTVYDPL 1141 190 \$2-76 1136 TVYDPLQPELDS 1147 191 \$2-77 1142 QPELDSFKEELD 1153 192 \$2-78 1148 FKELDXYFNH		177	62 62	1052		1000	
178 S2-64 1064 HVTYVPAQEKNF 1075 179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHOGKAHFPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQRNFYE 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-72 1112 POIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 190 S2-76 1130 IGIVNNTVYDPL 1141 190 S2-77 1142 QPELDSFKEELD 1147 191 S2-77 1142 QPELDSFKEELD 1147 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD<		177	32-03	1056	HGVVFLHVIIVF	1009	
179 S2-65 1070 AQEKNFTTAPAI 1081 180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQRNFYE 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TVYDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKELDXYFNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG <th></th> <td>178</td> <td>S2-64</td> <td>1064</td> <td>HVTYVPAQEKNF</td> <td>1075</td> <td></td>		178	S2-64	1064	HVTYVPAQEKNF	1075	
180 S2-66 1076 TTAPAICHDGKA 1087 181 S2-67 1082 CHDGKAHFPREG 1093 182 S2-68 1088 HFPREGKPVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQRNFYE 1111 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDV/IGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TYVDPLQPELDS 1147 191 S2-77 1142 QPELDSFKELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1166 LGDISGINASVV 1177 196 S2-81 1106 S		179	S2-65	1070	AQEKNFTTAPAI	1081	
181 S2-67 1082 CHDGKAHPPREG 1093 182 S2-68 1088 HFPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTRNFYE 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-72 1112 PQIIITDNTFVS 1123 187 S2-73 1118 DNTFVSCNCDVV 1129 188 S2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTV7DPL 1141 190 S2-76 1136 TVYDPLOPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVLGDISG 1171 195 S2-81 1178 NI		180	S2-66	1076	TTAPAICHDGKA	1087	
181 S2-67 1062 CHUGNARTPYREUS 1093 182 S2-68 1088 HPREGVYSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQRNFYE 1111 185 S2-71 1100 GRNFYEPQIITT 1117 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDV/IGIVNN 1135 Failure for synthesis 189 S2-76 1130 IGIVNNTVYDPL 1141 190 S2-77 1142 OPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRUNEV 1189 198 S2-84 1184 DRLNEVKNLNE </td <th></th> <td>100</td> <td>62 66</td> <td>1070</td> <td></td> <td>1007</td> <td></td>		100	62 66	1070		1007	
182 S2-68 1088 HPPREGVFVSNG 1099 183 S2-69 1094 VFVSNGTHWFVT 1105 184 S2-70 1100 THWFVTQRNFYE 1111 185 S2-71 1100 GRNFYEPQIITT 1117 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TVVDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV </td <th></th> <td>181</td> <td>52-67</td> <td>1082</td> <td>CHDGKAHFPREG</td> <td>1093</td> <td></td>		181	52-67	1082	CHDGKAHFPREG	1093	
183 \$2-69 1094 VFVSNGTHWFVT 1105 184 \$2-70 1100 THWFVTQRNFYE 1111 185 \$2-71 1106 QRNFYEPQIITT 1117 186 \$2-72 1112 PQIITTDNTFVS 1123 187 \$2-73 1118 DNTFVSGNCDVV 1129 188 \$2-74 1124 GNCDVVGIVN 1135 Failure for synthesis 189 \$2-75 1130 IGIVNNTVYDPL 1141 190 \$2-76 1136 TVYDPLQPELDS 1147 191 \$2-77 1142 QPELDSFKEELD 1153 192 \$2-78 1148 FKEELDKYFKNH 1159 193 \$2-79 1154 KYFKNHTSPDVD 1165 194 \$2-80 1160 TSPDVDLGDISG 1171 195 \$2-81 1166 LGDISGINASVV 1177 196 \$2-82 1172 INASVVNIQKEI 1183 197 \$2-83 1178 NIQKEIDRLNEV 1189 198 \$2-84 1184 DRLNEVAKNLNE <th></th> <td>182</td> <td>S2-68</td> <td>1088</td> <td>HFPREGVFVSNG</td> <td>1099</td> <td></td>		182	S2-68	1088	HFPREGVFVSNG	1099	
184 S2-70 1100 THWFVTQRNFYE 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TVYDPLQFELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1199 198 S2-84 1202		183	S2-69	1094	VFVSNGTHWFVT	1105	
105 0.1 1100 Intro Intr 1111 185 S2-71 1106 QRNFYEPQIITT 1117 186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TVYDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDX 1153 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 196 S2-81 1166 LGDISGINASVV 1177 196 S2-84 1184 DRLNEVAKNINE 1189 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184		184	\$2-70	1100	THWEVTORNEVE	1111	
185 S2-71 1106 URNPYEPUIIT 1117 186 S2-72 1112 POIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVIGVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVPPL 1141 190 S2-76 1136 TVPDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1160 TSPDVDLGDISG 1171 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1189 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE <th></th> <td>104</td> <td>02 70</td> <td>1100</td> <td></td> <td>4447</td> <td></td>		104	02 70	1100		4447	
186 S2-72 1112 PQIITTDNTFVS 1123 187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TVYDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG<		185	52-71	1106	QRNFYEPQIITI	1117	
187 S2-73 1118 DNTFVSGNCDVV 1129 188 S2-74 1124 GNCDVVIGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTVYDPL 1141 190 S2-76 1136 TVYDPLQPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVINCKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKINE 1195 199 S2-85 1190 AKNLNESLIDQ 1201 200 S2-87 1202 ELGKYEQYIKWP 1213 201 S2-87 1202 FI		186	S2-72	1112	PQIITTDNTFVS	1123	
188 S2-74 1124 GNCDV/IGIVNN 1135 Failure for synthesis 189 S2-75 1130 IGIVNNTYDPL 1141 190 S2-76 1136 TVYDPLQPLDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESUDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYI		187	S2-73	1118	DNTFVSGNCDVV	1129	
100 52-74 1124 OROUNTLY DENTITY 1135 Failure for synthesis 189 \$2-76 1136 TVYDPLQPELDS 1141 190 \$2-76 1136 TVYDPLQPELDS 1147 191 \$2-77 1142 QPELDSFKEELD 1153 192 \$2-78 1148 FKEELDKYFKNH 1159 193 \$2-79 1154 KYFKNHTSPDVD 1165 194 \$2-80 1160 TSPDVDLGDISG 1171 195 \$2-81 1166 LGDISGINASVV 1177 196 \$2-82 1172 INASVVNIQKEI 1183 197 \$2-83 1178 NIQKEIDRLNEV 1189 198 \$2-84 1184 DRLNEVAKNLNE 1195 199 \$2-85 1190 AKNLNESLIDLQ 1201 200 \$2-86 1196 SLIDLQELGKYE 1207 201 \$2-87 1202 ELGKYEQYIKWP 1213 202 \$2-88 1208		188	\$2-74	112/		1135	Failure for synthesis
189 S2-75 1130 IGIVNN I VYDPL 1141 190 S2-76 1136 TVYDPLOPELDS 1147 191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1202 FIAGLIAVMVT 1231 Failure for synthesis 204 S2-90 1220 FIAGLIAVMVT 1237 Failure for synthesis 205 S2-91		100	32-74	1124	GINEDVVIGIVININ	1135	r allule for synthesis
190 \$2-76 1136 TVYDPLQPELDS 1147 191 \$2-77 1142 QPELDSFKEELD 1153 192 \$2-78 1148 FKEELDKYFKNH 1159 193 \$2-79 1154 KYFKNHTSPDVD 1165 194 \$2-80 1160 TSPDVDLGDISG 1171 195 \$2-81 1166 LGDISGINASVV 1177 196 \$2-82 1172 INASVVNIQKEI 1183 197 \$2-83 1178 NIQKEIDRLNEV 1189 198 \$2-84 1184 DRLNEVAKNLNE 1195 199 \$2-85 1190 AKNLNESLIDLQ 1201 200 \$2-86 1196 SLIDLQELGKYE 1207 201 \$2-87 1202 ELGKYEQYIKWP 1213 202 \$2-88 1204 QYIKWPWYIWLG 1219 203 \$2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 205 \$2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 205 \$2-91		189	S2-75	1130	IGIVNNTVYDPL	1141	
191 S2-77 1142 QPELDSFKEELD 1153 192 S2-78 1148 FKEELDKYFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1202 GLIAYEQYIKWP 1213 203 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1237 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis		190	S2-76	1136	TVYDPLQPELDS	1147	
101 02 S2-78 1142 GK EELDK YFKNH 1159 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKINE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1237 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1249 <td< td=""><th></th><td>191</td><td>S2-77</td><td>1142</td><td>OPEL DSEKEELD</td><td>1153</td><td></td></td<>		191	S2-77	1142	OPEL DSEKEELD	1153	
192 32-73 1143 FIRELDIA FUNIT 1139 193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLVAKNINE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIW/TIMLCCM 1237 Failure for synthesis 206 S2-92 1238 TSCCSCLKGCCS 1249 208		102	C2 79	11/0		1150	
193 S2-79 1154 KYFKNHTSPDVD 1165 194 S2-80 1160 TSPDVDLGDISG 1171 195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble		132	52-70	1140		1155	
194 \$2-80 1160 TSPDVDLGDISG 1171 195 \$2-81 1166 LGDISGINASVV 1177 196 \$2-82 1172 INASVVNIQKEI 1183 197 \$2-83 1178 NIQKEIDRLNEV 1189 198 \$2-84 1184 DRLNEVAKNLNE 1195 199 \$2-85 1190 AKNLNESLIDLQ 1201 200 \$2-86 1196 \$LIDLQELGKYE 1207 201 \$2-87 1202 ELGKYEQYIKWP 1213 202 \$2-88 1208 QYIKWPWYIWLG 1219 203 \$2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 \$2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 \$2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 \$2-92 1232 IMLCCMTSCCSC 1249 1180 208 \$2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 \$2-95 1250 CGSCCKFDEDDS		193	S2-79	1154	KYFKNHISPDVD	1165	
195 S2-81 1166 LGDISGINASVV 1177 196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1249 208 S2-94 1244 LKGCCSCGSCCK 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261		194	S2-80	1160	TSPDVDLGDISG	1171	
196 S2-82 1172 INASVVNIQKEI 1183 197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		195	S2-81	1166	I GDISGINASVV	1177	
190 52-52 1172 INASY VINUREL 1163 197 \$2-83 1178 NIQKEIDRLNEV 1189 198 \$2-84 1184 DRLNEVAKNLNE 1195 199 \$2-85 1190 AKNLNESLIDLQ 1201 200 \$2-86 1196 \$LIDLQELGKYE 1207 201 \$2-87 1202 ELGKYEQYIKWP 1213 202 \$2-88 1208 QYIKWPWYIWLG 1219 203 \$2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 \$2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 \$2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 \$2-92 1232 IMLCCMTSCCSC 1249 208 \$2-93 1238 TSCCSCLKGCCS 1249 209 \$2-95 1250 CGSCCKFDEDDS 1261 210 \$2-96 1256 FDEDDSEPVLKG 1267 211 \$2-97 1262 EPVLKGVKLHYT 1273 <th></th> <td>106</td> <td>62.07</td> <td>1170</td> <td></td> <td>1102</td> <td></td>		106	62.07	1170		1102	
197 S2-83 1178 NIQKEIDRLNEV 1189 198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVL		190	32-02	1172	INASVVINIQKEI	1103	
198 S2-84 1184 DRLNEVAKNLNE 1195 199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		197	S2-83	1178	NIQKEIDRLNEV	1189	
199 S2-85 1190 AKNLNESLIDLQ 1201 200 S2-86 1196 SLIDLQELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		198	S2-84	1184	DRLNEVAKNLNE	1195	
100 52.86 1196 SLIDLQELGKYE 1207 201 \$2.87 1202 ELGKYEQYIKWP 1213 202 \$2.88 1208 QYIKWPWYIWLG 1219 203 \$2.89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 \$2.90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 \$2.91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 \$2.92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 \$2.93 1238 TSCCSCLKGCCS 1249 208 \$2.94 1244 LKGCCSCGSCCK 1255 Insoluble 209 \$2.95 1250 CGSCCKFDEDDS 1261 210 \$2.96 1256 FDEDDSEPVLKG 1267 211 \$2.97 1262 EPVLKGVKLHYT 1273		199	\$2-85	1190	AKNI NESUDI O	1201	
200 S2-86 1196 SLIDLUELGKYE 1207 201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		100	02 00	1100		1201	
201 S2-87 1202 ELGKYEQYIKWP 1213 202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		200	52-60	1190	SLIDLQELGKTE	1207	
202 S2-88 1208 QYIKWPWYIWLG 1219 203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		201	S2-87	1202	ELGKYEQYIKWP	1213	
203 S2-89 1214 WYIWLGFIAGLI 1225 Failure for synthesis 204 S2-90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		202	S2-88	1208	QYIKWPWYIWLG	1219	
200 02.05 12.14 W HWEDTRACH 1225 Failure for synthesis 204 \$2.90 1220 FIAGLIAIVMVT 1231 Failure for synthesis 205 \$2.91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 \$2.92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 \$2.93 1238 TSCCSCLKGCCS 1249 208 \$2.94 1244 LKGCCSCGSCCK 1255 Insoluble 209 \$2.95 1250 CGSCCKFDEDDS 1261 210 \$2.96 1256 FDEDDSEPVLKG 1267 211 \$2.97 1262 EPVLKGVKLHYT 1273		203	S2-80	1214	WYIWI GEIAGU	1225	Failure for synthesis
204 52-90 1220 FIAGLIAIVMV I 1231 Failure for synthesis 205 \$2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 \$2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 \$2-93 1238 TSCCSCLKGCCS 1249 208 \$2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 \$2-95 1250 CGSCCKFDEDDS 1261 210 \$2-96 1256 FDEDDSEPVLKG 1267 211 \$2-97 1262 EPVLKGVKLHYT 1273		200	62.00	4000		1220	
205 S2-91 1226 AIVMVTIMLCCM 1237 Failure for synthesis 206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		204	52-90	1220	FIAGLIAIVMVI	1231	Failure for synthesis
206 S2-92 1232 IMLCCMTSCCSC 1243 Failure for synthesis 207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		205	S2-91	1226	AIVMVTIMLCCM	1237	Failure for synthesis
207 S2-93 1238 TSCCSCLKGCCS 1249 208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		206	S2-92	1232	IMLCCMTSCCSC	1243	Failure for synthesis
208 S2-95 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		207	\$2-02	1232	TSCCSCLKGCCS	12/0	
208 S2-94 1244 LKGCCSCGSCCK 1255 Insoluble 209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		207	32-93	1230		1249	
209 S2-95 1250 CGSCCKFDEDDS 1261 210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		208	52-94	1244	LKGUUSUGSUUK	1255	Insoluble
210 S2-96 1256 FDEDDSEPVLKG 1267 211 S2-97 1262 EPVLKGVKLHYT 1273		209	S2-95	1250	CGSCCKFDEDDS	1261	
211 S2-97 1262 EPVLKGVKLHYT 1273		210	S2-96	1256	EDEDDSEPVI KG	1267	
211 32-37 1202 EFVLKGVKLHTT 1273		214	S2 07	1000		1070	
	-	211	52-91	1202		1213	

COVID-19 pati	n=55	
Gender	Male	27
Gender	Female	28
Age		41.5±14.9
Soverity	mild cases	8
Sevency	moderate cases	47
Days after onset		27.5±7.7
hospital stay (days)		14.0±5.6
Control g	roup	n=18
Lung cancer pa	tients (LC)	9
Health cont	9	
Conder	Male	8
Genuer	Female	10
Age		50.4±12.5
Sample collection (year)	2017-2018	

Table S2. Serum samples used in this study