Figure 1

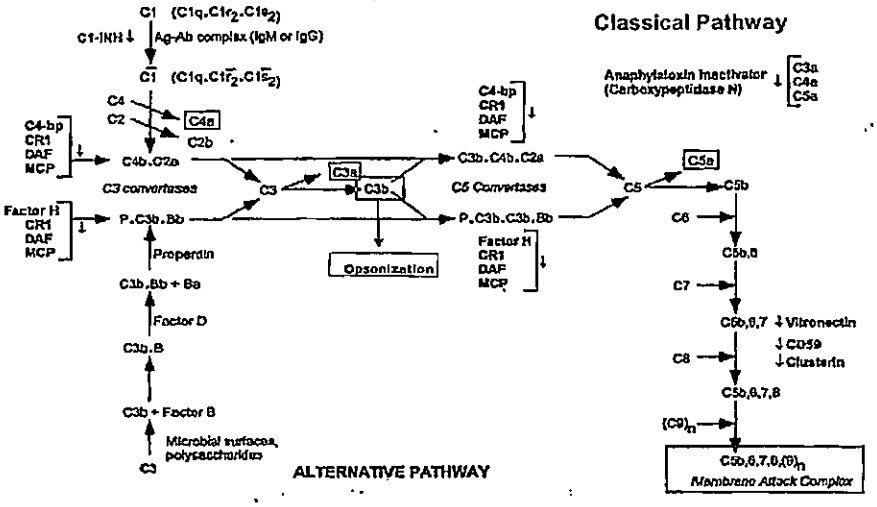

Classical Pathway
C1 (C1q.C1r2.C1s2)
C1-INH
Ag-Ab complex (IgM or IgG)
C1 (C1q.C1r2.C1s2)
C4
C2
C4a
C2b
C4b.C2a
C3 convertases
C3
C3a
C3b
C4-bp
CR1
DAF
MCP
Factor H
CR1
DAF
MCP
P.C3b.Bb
Properdin
C3b.Bb + Ba
Factor D
C3b.B
C3b + Factor B
Microbial surfaces, polysaccharides
C3
ALTERNATIVE PATHWAY
Opsonization
C3b.C4b.C2a
C5 Convertases
P.C3b.C3b.Bb
C4-bp
CR1
DAF
MCP
Factor H
CR1
DAF
MCP
Anaphylatoxin Inactivator (Carboxypeptidase N)
C3a
C4a
C5a
C5
C5a
C5b
C6
C5b,6
C7
C5b,6,7
Vitronectin
CD59
Clusterin
C8
C5b,6,7,8
(C9)n
C5b,6,7,8,(9)n
Membrane Attack Complex

Figure 2

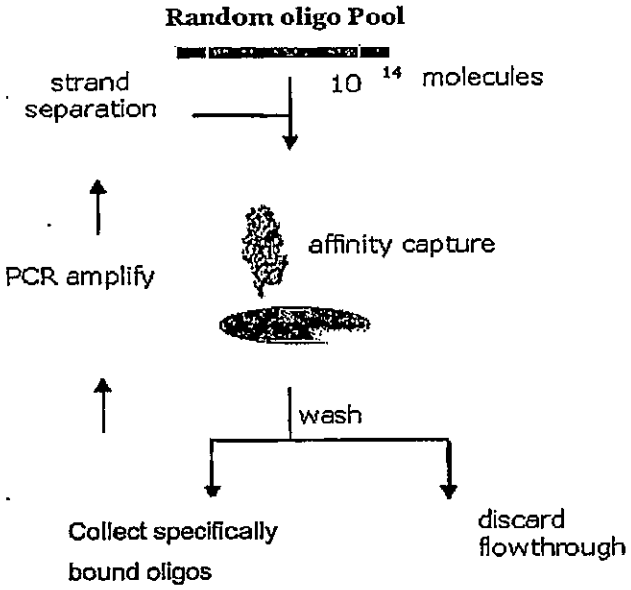
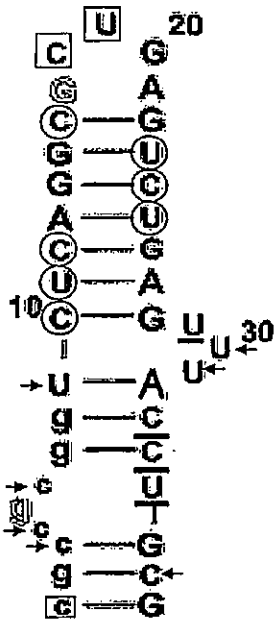
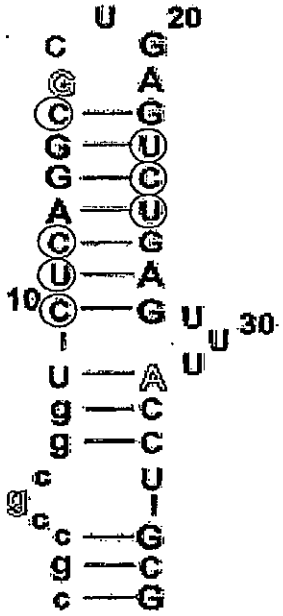

Random oligo Pool
strand separation
10 14 molecules
PCR amplify
affinity capture
wash
Collect specifically bound oligos
discard flowthrough

Figure 3A



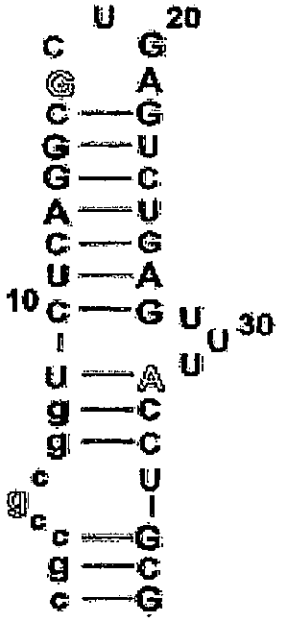
(SEQ ID NO: 1)

Figure 3B



ARC330 (SEQ ID NO: 2)

Figure 3C



ARC186 (SEQ ID NO: 4)

Figure 4

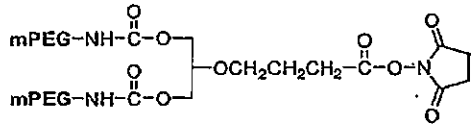


Figure 5

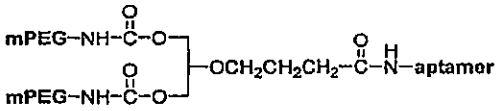


Figure 6

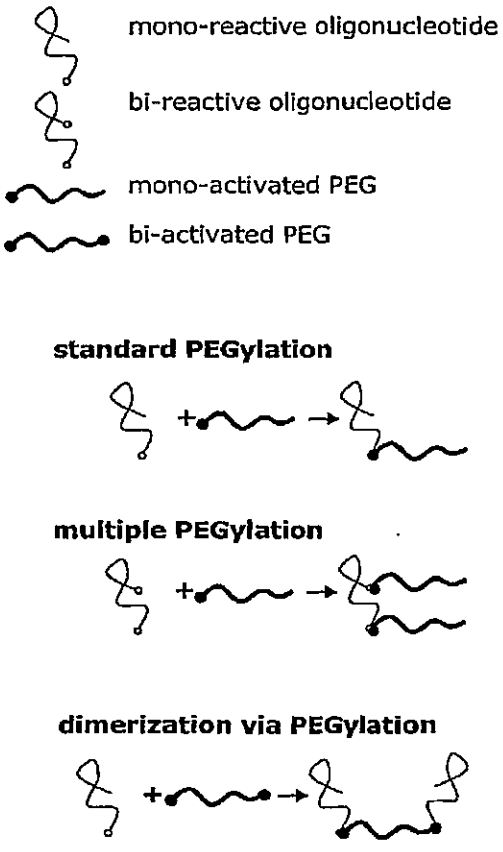

mono-reactive oligonucleotide
bi-reactive oligonucleotide
mono-activated PEG
bi-activated PEG
standard PEGylation
multiple PEGylation
dimerization via PEGylation

Figure 7A

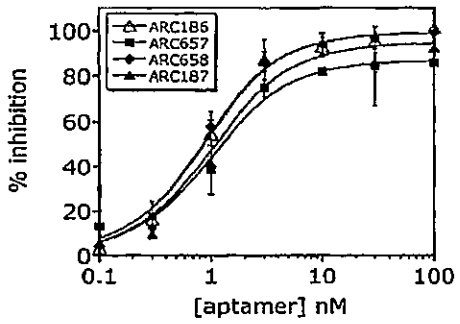


Figure7B

ARC#	PEG modification	IC50 (nM)
186	No PEG	0.5 ± 0.1
657	ARC186+20 kDa	0.6 ± 0.1
658	ARC186+30 kDa	0.5 ± 0.1
187	40 kDa branched 1,3 bis(mPEG-[20 kDa])-propyl-2-(4'-butamide)	0.6 ± 0.2

Figure 7C

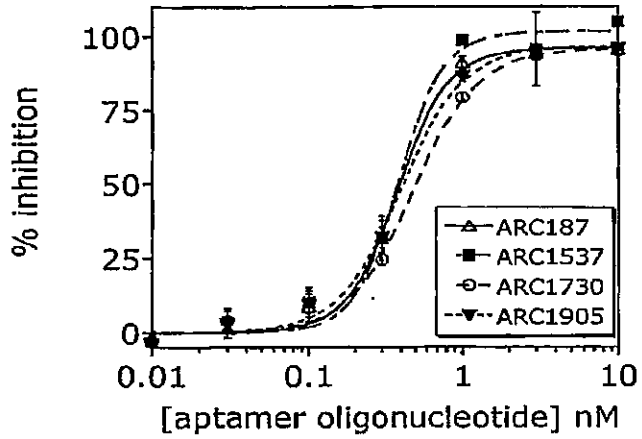


Figure 7D

ARC#	PEG modification	IC50 (nM)
187	40K branched 1,3 bis(mPEG-[20 kDa])-propyl-2-(4'-butamide)	0.38 ± 0.03
1537	40K Dow linear	0.39 ± 0.06
1730	2 x 20K linear	0.48 ± 0.04
1905	40K branched 2,3 bis(mPEG-[20 kDa])-propyl-1-carbamoyl	0.40 ± 0.03

Figure 8

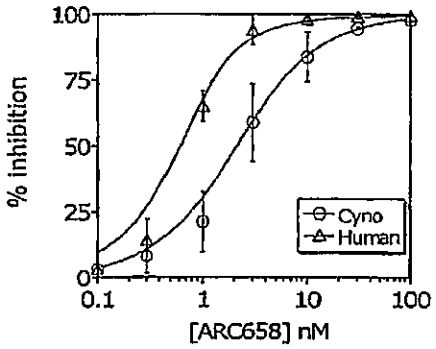


Figure 9

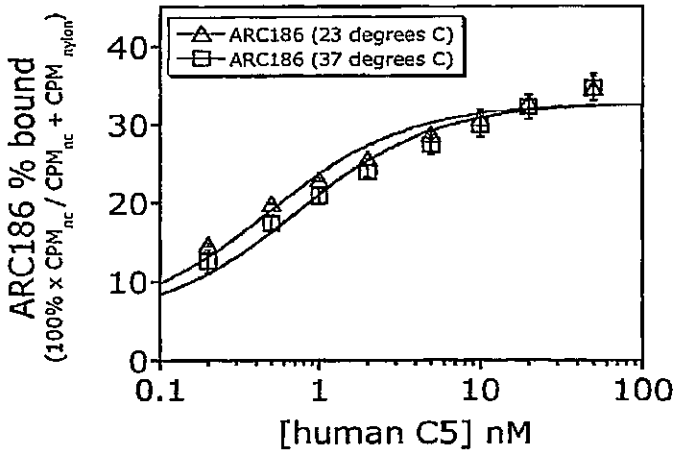

ARC186 (23 degrees C)
ARC186 (37 degrees C)
ARC186 % bound
(100% x CPM nc / CPM nc + CPM nylon)
40
30
20
10
0
0.1
1
10
100
[human C5] nM

Figure 10

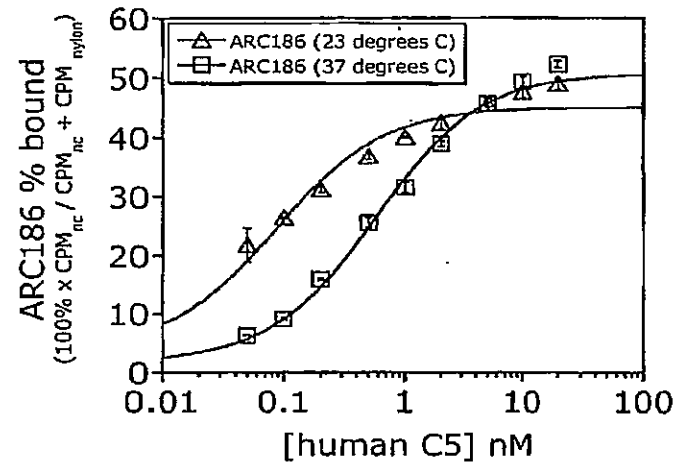

ARC186 (23 degrees C)
ARC186 (37 degrees C)
ARC186 % bound
(100% x CPM nc / CPM nc + CPM nylon)
60
50
40
30
20
10
0
0.01
0.1
1
10
100
[human C5] nM

Figure 11

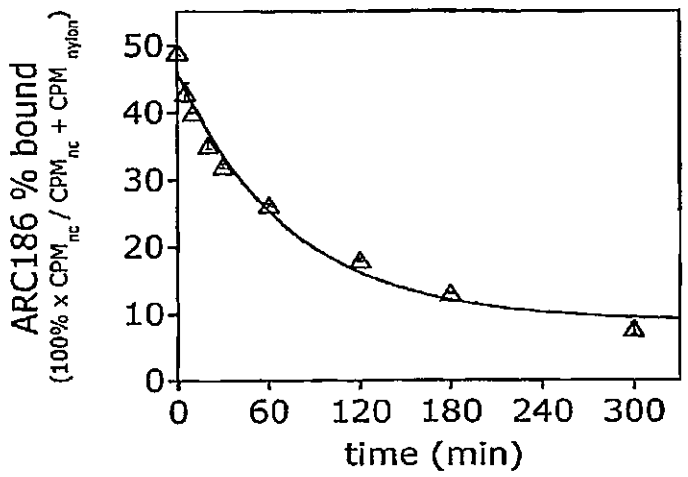

ARC186 % bound
(100% x CPM nc / CPM nc + CPM nylon)
50
40
30
20
10
0
0
60
120
180
240
300
time (min)

Figure 12

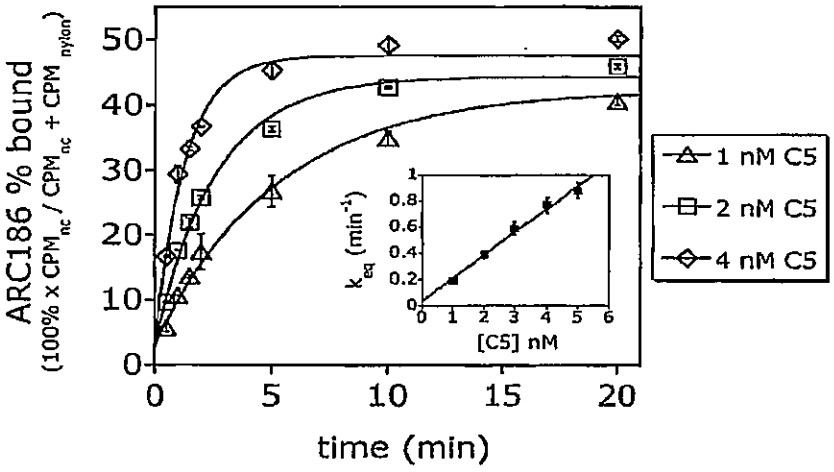

ARC186 % bound
(100% x CPM nc / CPM nc + CPM nylon)
50
40
30
20
10
0
0
5
10
15
20
time (min)
1 nM C5
2 nM C5
4 nM C5
k eq (min-1)
1
0.8
0.6
0.4
0.2
0
0 1 2 3 4 5 6
[C5] nM

Figure 13

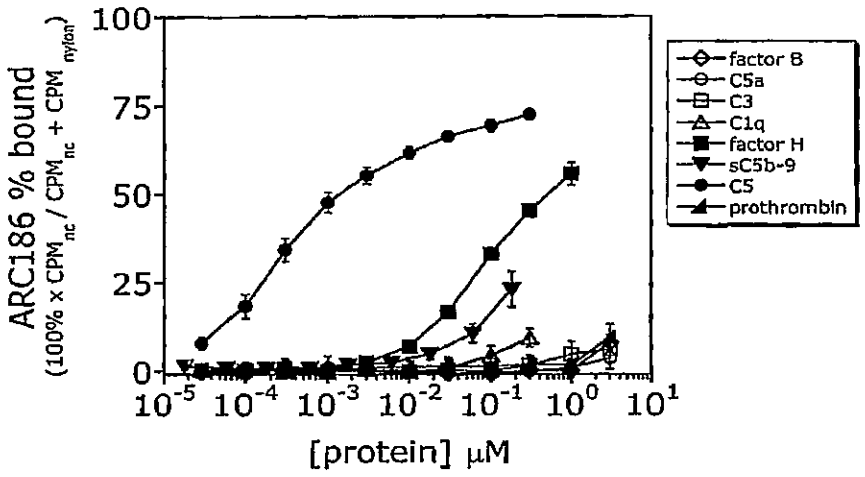

ARC186 % bound
(100% x CPM$_{nc}$ / CPM$_{nc}$ + CPM$_{nylon}$)
100
75
50
25
0
10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1}
[protein] μM
factor B
C5a
C3
C1q
factor H
sC5b-9
C5
prothrombin

Figure 14

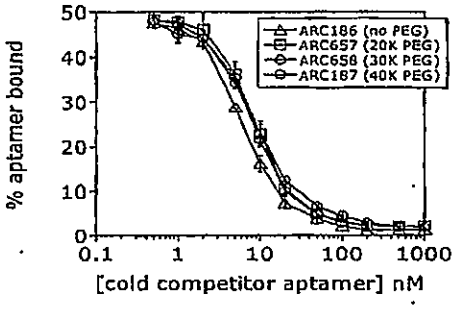

ARC186 (no PEG)
ARC657 (20K PEG)
ARC658 (30K PEG)
ARC187 (40K PEG)
% aptamer bound
50
40
30
20
10
0
0.1
1
10
100
1000
[cold competitor aptamer] nM

Figure 15

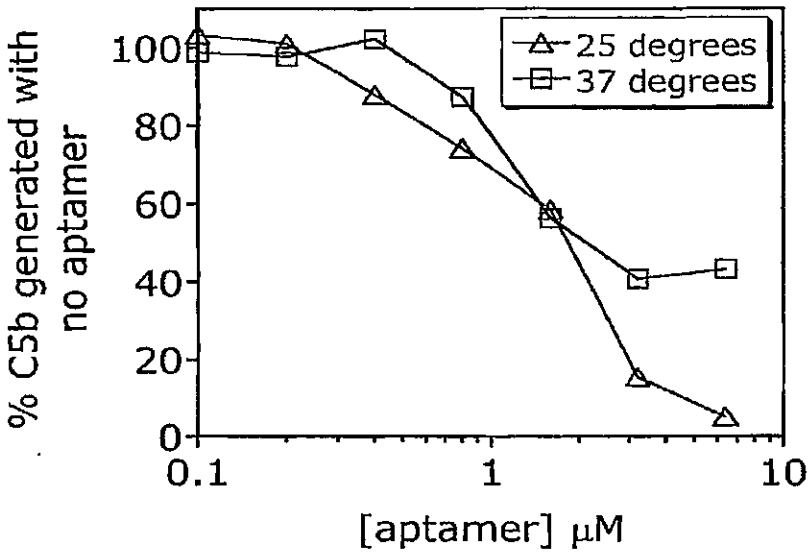

% C5b generated with no aptamer
100
80
60
40
20
0
0.1
1
10
[aptamer] μM
25 degrees
37 degrees

Figure 16

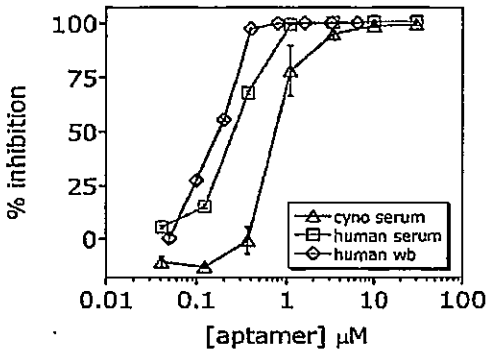

100
75
50
25
0
% inhibition
0.01
0.1
1
10
100
[aptamer] μM
cyno serum
human serum
human wb

Figure 17

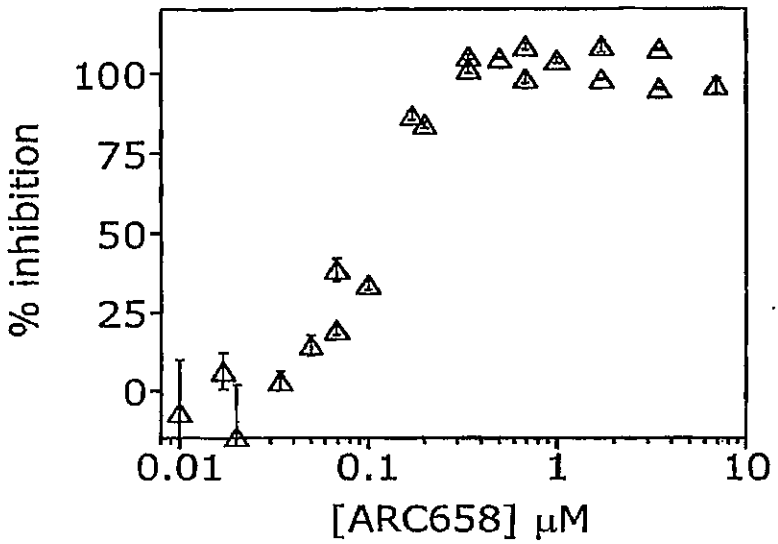


Figure 18

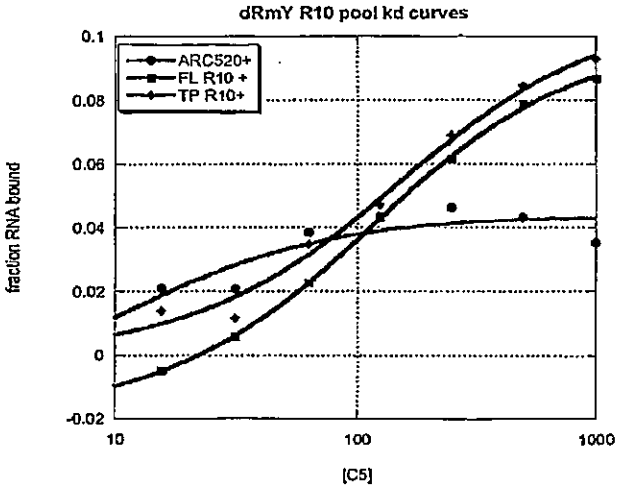

dRmY R10 pool kd curves
ARC520+
FL R10 +
TP R10+
fraction RNA bound
0.1
0.08
0.06
0.04
0.02
0
-0.02
10
100
1000
[C5]

Figure 19

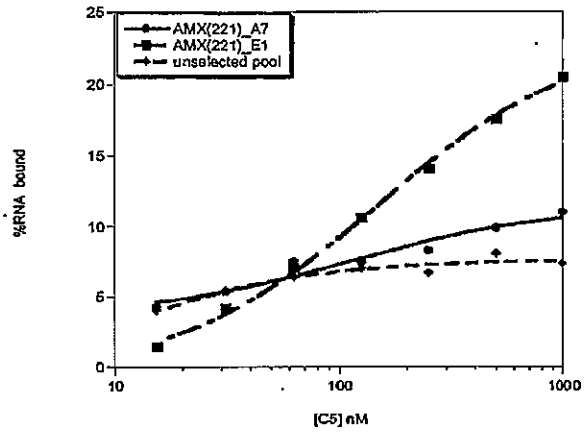

AMX(221)_A7
AMX(221)_E1
unselected pool
%RNA bound
[C5] nM
25
20
15
10
5
0
10
100
1000

Figure 20

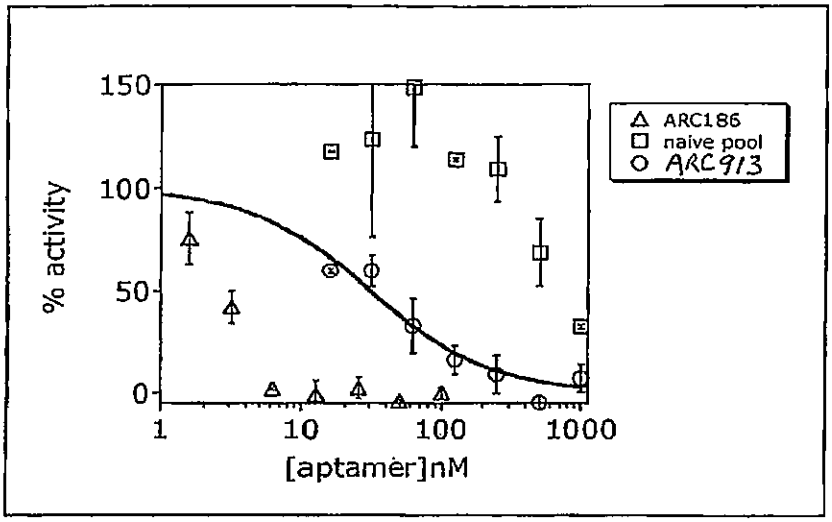
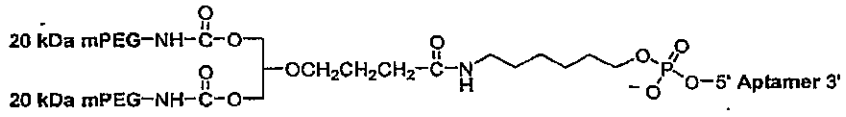

150
100
50
0
% activity
1
10
100
1000
[aptamer]nM
ARC186
naive pool
ARC913

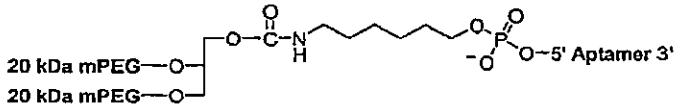
Figure 21



Aptamer =
CmGfCfCGfCmGmGfUfCfUfCmAmGmGfCGfCfUmGmAmGfUfCfUmGmAmGfUfUf
UAfCfCfUmGfCmG-3T (SEQ ID NO 4)

ARC187 (SEQ ID NO: 5)

Figure 22



Aptamer =
CmGfCfCGfCmGmGfUfCfUfCmAmGmGfCGfCfUmGmAmGfUfCfUmGmAmGfUfUf
UAfCfCfUmGfCmG-3T (SEQ ID NO 4)

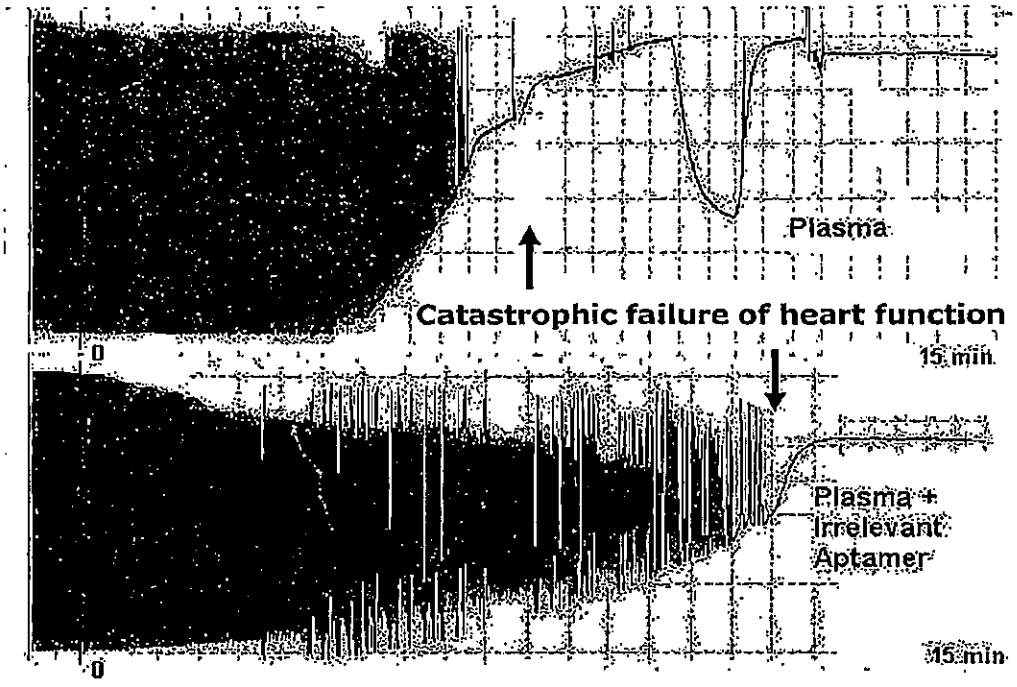
ARC1905 (SEQ ID NO: 67)

Figure 23

Group	# mice	Test Article	Dose		Measurements
			Conc (nM)	Perfusion rate mL/min	
1	5	No aptamer	0	3	Heart rate, rhythm, left ventricular pressure
3	3	Irrelevant aptamer at 50X molar ratio	1500	3	Heart rate, rhythm, left ventricular pressure
4	3	ARC186 at molar equivalence	30	3	Heart rate, rhythm, left ventricular pressure
5	5	ARC186 at 10X molar ratio	300	3	Heart rate, rhythm, left ventricular pressure
6	4	ARC186 at 50X molar ratio	1500	3	Heart rate, rhythm, left ventricular pressure

Figure 24

A


Plasma
Catastrophic failure of heart function
0
15 min
Plasma +
Irrelevant
Aptamer
0
15 min

B

Figure 25

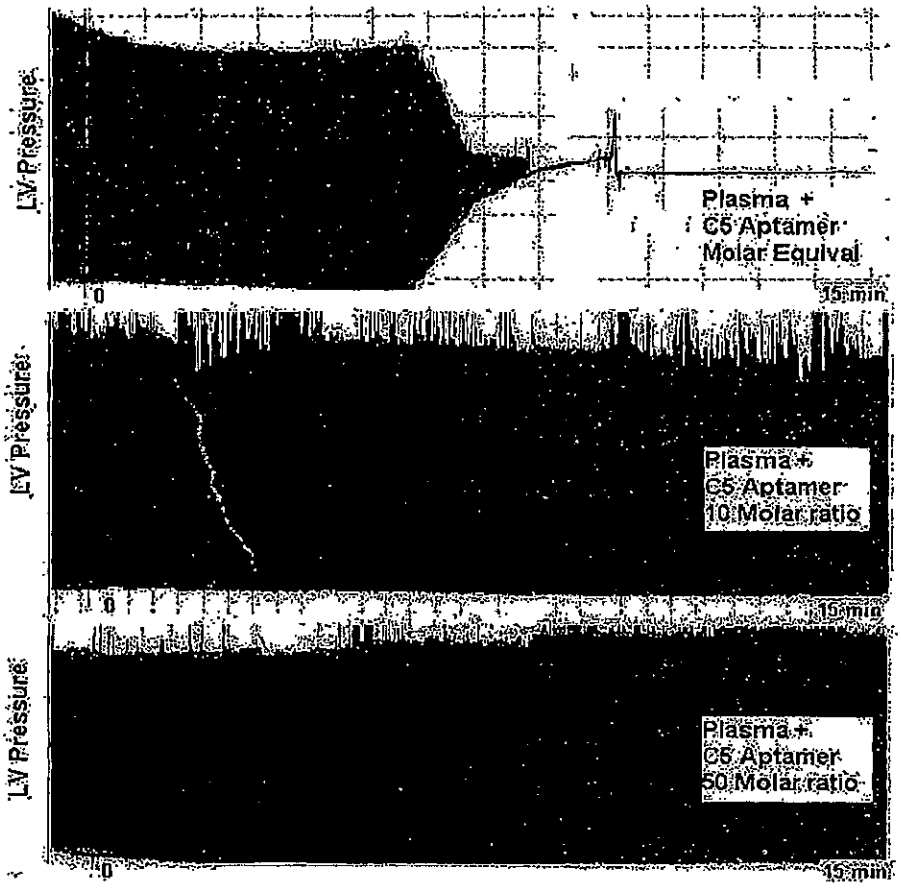

LV Pressure
Plasma +
C5 Aptamer
Molar Equival
0
15 min
LV Pressure
Plasma +
C5 Aptamer
10 Molar ratio
0
15 min
LV Pressure
Plasma +
C5 Aptamer
50 Molar ratio
0
15 min

Figure 26

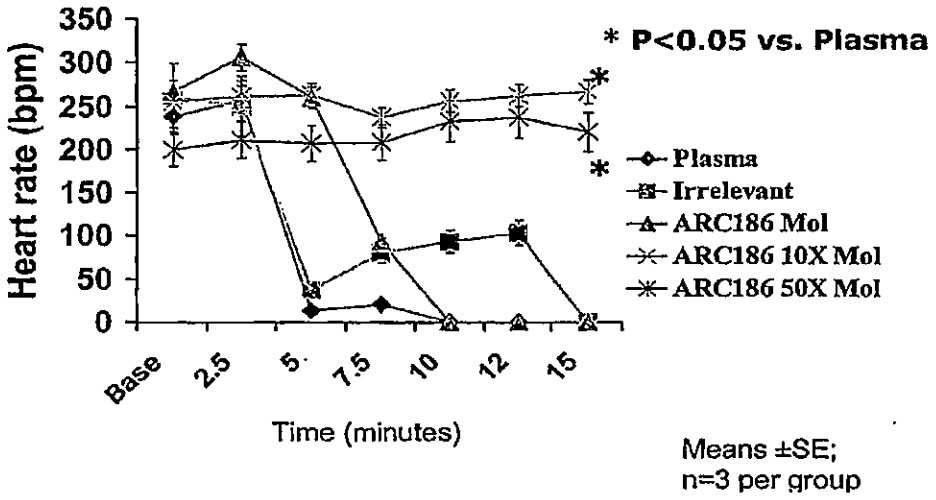

Heart rate (bpm)
350
300
250
200
150
100
50
0
Base
2.5
5
7.5
10
12
15
Time (minutes)
* P<0.05 vs. Plasma
Plasma
Irrelevant
ARC186 Mol
ARC186 10X Mol
ARC186 50X Mol
Means ±SE;
n=3 per group

Figure 27

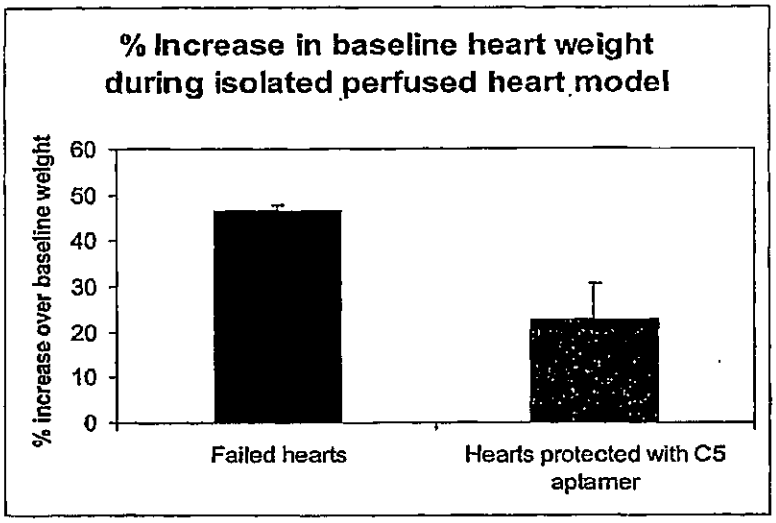

% Increase in baseline heart weight during isolated perfused heart model
% increase over baseline weight
60
50
40
30
20
10
0
Failed hearts
Hearts protected with C5 aptamer

Figure 28

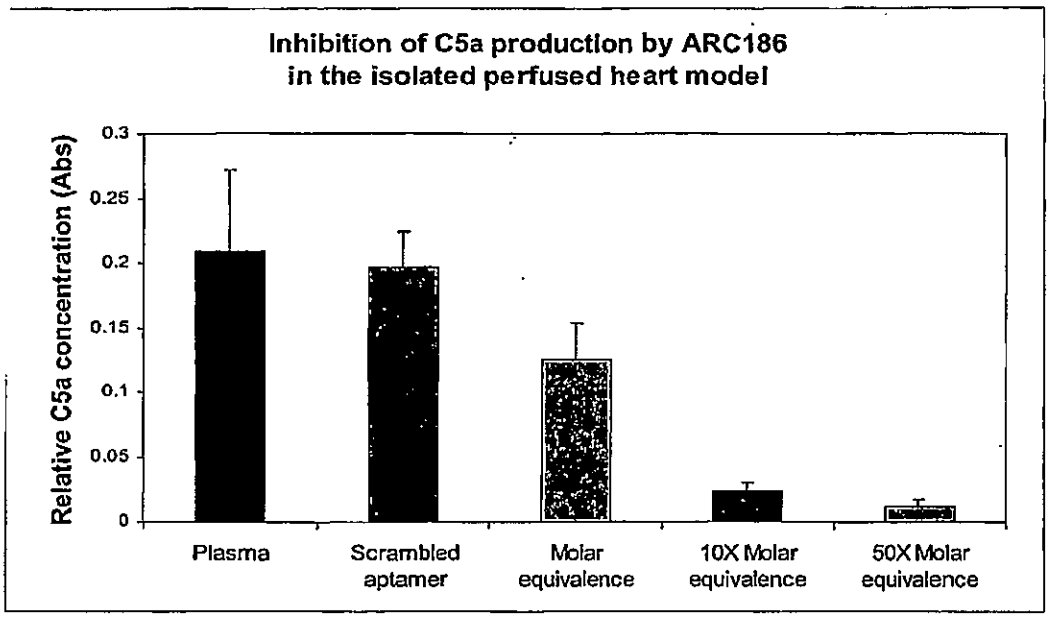

Inhibition of C5a production by ARC186
in the isolated perfused heart model
Relative C5a concentration (Abs)
0.3
0.25
0.2
0.15
0.1
0.05
0
Plasma
Scrambled aptamer
Molar equivalence
10X Molar equivalence
50X Molar equivalence

Figure 29

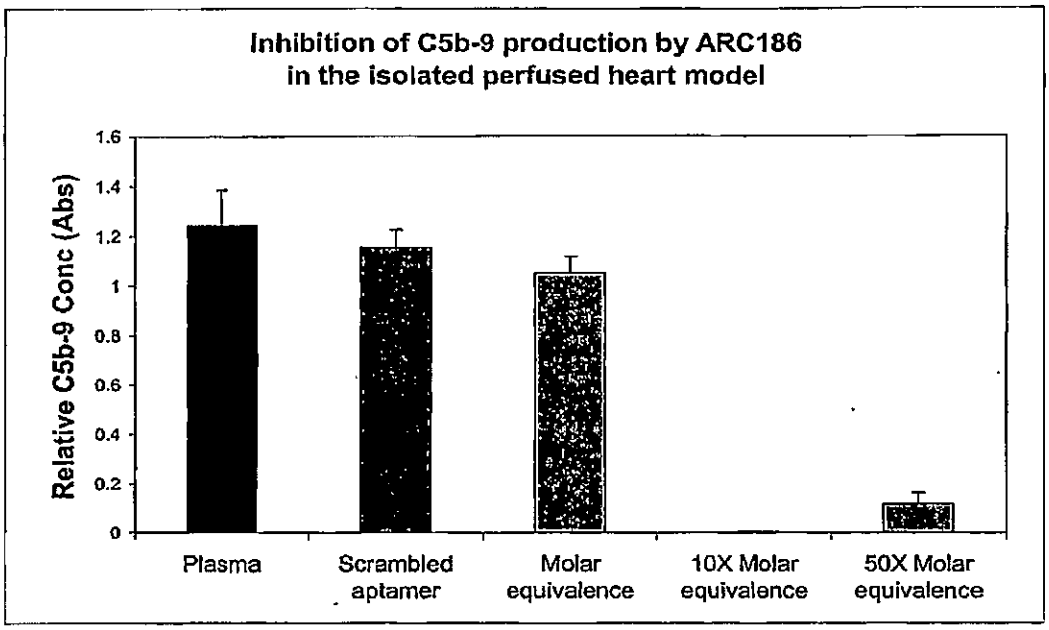

Inhibition of C5b-9 production by ARC186
in the isolated perfused heart model
Relative C5b-9 Conc (Abs)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Plasma
Scrambled aptamer
Molar equivalence
10X Molar equivalence
50X Molar equivalence

Figure 30

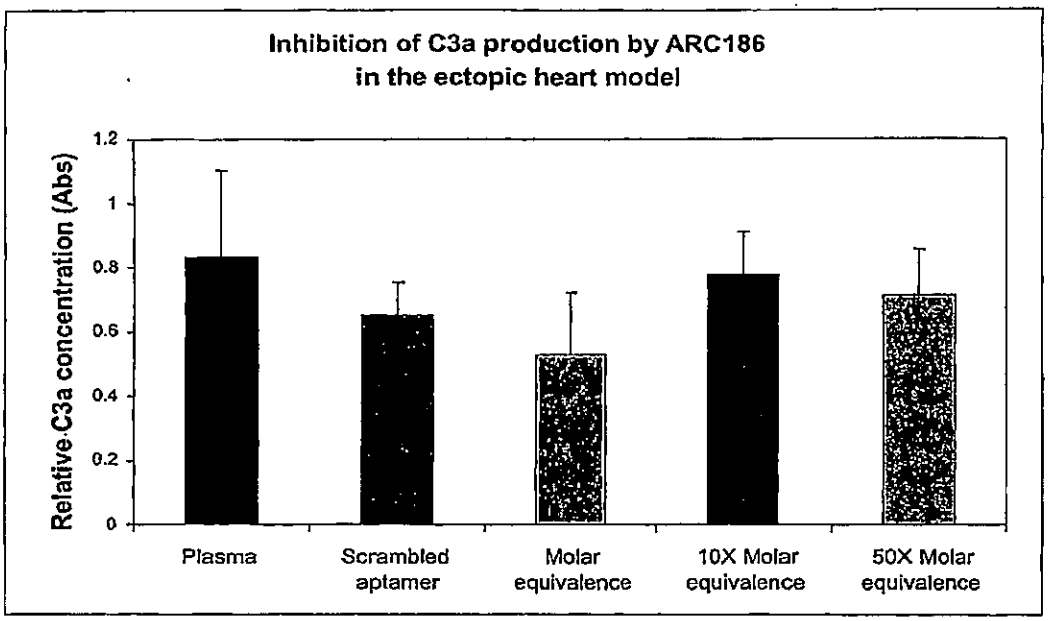

Inhibition of C3a production by ARC186
in the ectopic heart model
Relative C3a concentration (Abs)
1.2
1
0.8
0.6
0.4
0.2
0
Plasma
Scrambled aptamer
Molar equivalence
10X Molar equivalence
50X Molar equivalence

Figure 31

Animal	Treatment	Irrelevant	C3b	C5b-9
1-001 (1/26)	None	neg	Pos	pos
1-002 (1-26)	None	neg	Pos	pos
1-001	None	neg	Pos	pos
1-002	None	neg	Pos	pos
1-003	None	neg	Pos	pos
3-001	Irrelevant aptamer 50X molar	neg	Pos	pos
3-002	Irrelevant aptamer 50X molar	neg	Pos	pos
3-003	Irrelevant aptamer 50X molar	neg	Pos	pos
4-001	C5 aptamer molar equivalence	neg	Pos	pos
4-002	C5 aptamer molar equivalence	neg	Pos	pos
4-003	C5 aptamer molar equivalence	neg	Pos	pos
5-001	C5 aptamer 10X molar equivalence	neg	Pos	neg
5-002	C5 aptamer 10X molar equivalence	neg	Pos	neg
5-003	C5 aptamer 10X molar equivalence	neg	Pos	neg
5-004	C5 aptamer 10X molar equivalence	neg	Pos	neg
5-005	C5 aptamer 10X molar equivalence	neg	Pos	neg
6-001	C5 aptamer 50X molar equivalence	neg	Pos	neg
6-002	C5 aptamer 50X molar equivalence	neg	Pos	neg
6-003	C5 aptamer 50X molar equivalence	neg	Pos	neg
6-004	C5 aptamer 50X molar equivalence	neg	Pos	neg

Figure 32

Animal	Compound	Serum	Molar ratio	Increased EDP	Failure (Y or No)	Time to failure
1-001	ARC658	Human	0	Y	Y	4 min 30 sec
1-002	ARC658	Human	0	Y	Y	4 min 39 sec
1-003	ARC658	Human	0	Y	Y	3 min 20 sec
1-004	ARC658	Human	0	Y	Y	12 min 24 sec
1-005	ARC658	Human	0	Y	N	NA
1-006	ARC658	Human	0	Y	Y	8 min 30 sec
1a-001	ARC658	Human	0.5	Y	Y	7 min 22 sec
1a-002	ARC658	Human	0.5	Y	Y	7 min 30 sec
1a-003	ARC658	Human	0.5	Y	Y	8 min 13 sec
2-001	ARC658	Human	1	N	N	NA
2-002	ARC658	Human	1	N	N	NA
2-003	ARC658	Human	1	N	N	NA
2-004	ARC658	Human	1	N	N	NA
3-001	ARC658	Human	3	N	N	NA
3-002	ARC658	Human	3	N	N	NA
3-003	ARC658	Human	3	N	N	NA
6-001	ARC658	Primate	0	Y	Y	2 min 30 sec
6-002	ARC658	Primate	0	Y	Y	2 min 47 sec
6-003	ARC658	Primate	0	Y	Y	3 min 30 sec
6-004	ARC658	Primate	0	Y	Y	1 min 28 sec
6a-001	ARC658	Primate	3	Y	Y	5 min 2 sec
6a-002	ARC658	Primate	3	Y	Y	4 min 30 sec
6a-003	ARC658	Primate	3	Y	Y	3 min 43 sec
6a-004	ARC658	Primate	3	Y	Y	8 min 0 sec
7-001	ARC658	Primate	10	Y	N	NA
7-002	ARC658	Primate	10	Y	N	NA
7-003	ARC658	Primate	10	Y	Y	9 min 15 sec
7-004	ARC658	Primate	10	Y	N	NA
9-001	ARC658	Primate	20	Y	Y	12 min 50 sec
11-001	ARC658	Primate	30	Y	N	NA
11-002	ARC658	Primate	30	Y	Y	10 min 0 sec
11-003	ARC658	Primate	30	Y	N	NA
13-001	ARC658	Primate	50	N	N	NA
13-002	ARC658	Primate	50	N	N	NA
13-003	ARC658	Primate	50	N	N	NA

Figure 33

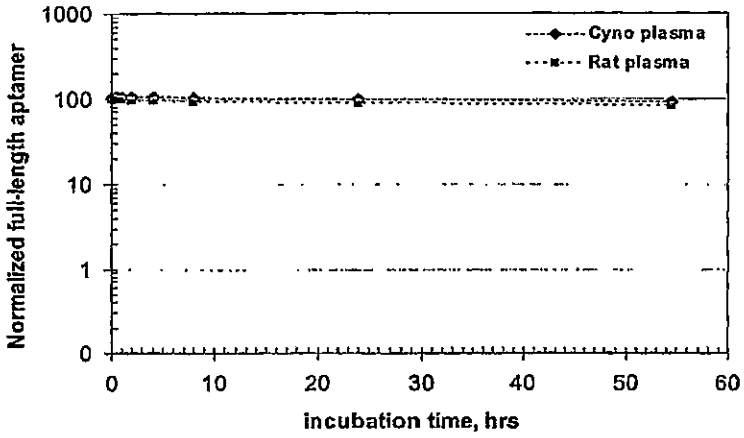

1000
100
10
1
0
Normalized full-length aptamer
0
10
20
30
40
50
60
incubation time, hrs
Cyno plasma
Rat plasma

Figure 34

Group Number	Number of Animals	Test Article	Dosage Level (mg/kg)	Dose Volume (mL/kg)	Dosing Regimen	Sample Collection
1	3	ARC657 20 kDa PEG	10	1	Intravenous bolus on Day 1	t= pre-dose, 0.5, 1, 2, 4, 8, 16, 24, 32, 48 hrs
2	3	ARC658 30 kDa PEG	10	1	Intravenous bolus on Day 1	t= pre-dose, 0.5, 1, 2, 4, 8, 16, 24, 32, 48 hrs
3	3	ARC187 40 kDa PEG	10	1	Intravenous bolus on Day 1	t= pre-dose, 0.5, 1, 2, 4, 8, 16, 24, 32, 48 hrs

Figure 35

PK of Anti-C5 Aptamer -PEG Conjugates In Sprague-Dawley Rat						
Aptamer	ARC657		ARC658		ARC187	
PEG Group	20 kDa		30 kDa		40 kDa	
	MEAN	STDEV	MEAN	STDEV	MEAN	STDEV
time (hrs)	Cp (μM)	Cp (μM)	Cp (μM)	Cp (μM)	Cp (μM)	Cp (μM)
0	0.00	0.00	0.00	0.00	0.00	0.00
0.5	12.77	2.67	2.97	0.62	6.52	1.77
1	13.38	2.08	4.09	1.44	7.94	1.08
2	6.63	1.87	3.40	0.66	6.57	1.56
4	2.38	0.87	2.22	0.39	4.56	0.54
8	0.72	0.18	2.87	1.84	1.53	0.57
12	0.31	0.03	0.60	0.09	1.45	0.17
24	< LLOQ	< LLOQ	0.47	0.17	0.73	0.03
32	< LLOQ	< LLOQ	< LLOQ	< LLOQ	0.49	0.01
48	< LLOQ	< LLOQ	< LLOQ	< LLOQ	0.27	0.02

Figure 36

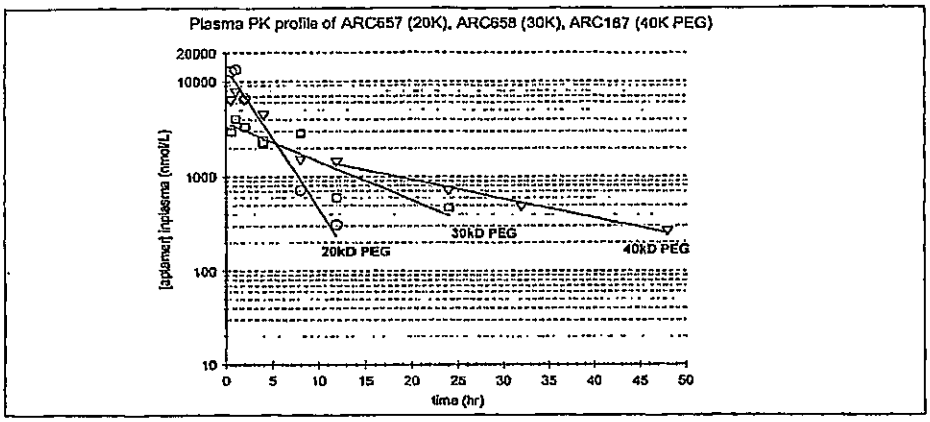

Plasma PK profile of ARC557 (20K), ARC658 (30K), ARC187 (40K PEG)
20000
10000
1000
100
10
[aptamer] inplasma (nmol/L)
0
5
10
15
20
25
30
35
40
45
50
time (hr)
20kD PEG
30kD PEG
40kD PEG

Figure 37

Species	Dose (mg/kg)	Admin Route	PEG Group	Cmax (μg/ml)	AUC (μg hr/mL)	t1/2 (α) (hr)	t1/2 (β) (hr)	Cl (mL/min/kg)	V (mL/kg)
rat	10	IV	20kD	169.97	458	-	2.05	0.36	65
rat	10	IV	30kD	52.00	497	-	7.40	0.34	220
rat	10	IV	40kD	100.85	886	-	15.00	0.19	188

Figure 38A

Group No.	No. Animals	Test Article	Dose		Dose Route	Sample Collection
			(mg/kg)	(mL/kg)		
1	33F	ARC187	10	4	IV	t=pre-dose, 0.5, 1, 2, 4, 8, 16, 24, 32, 48, 72 hrs
2	33F	ARC1905	10	4	IV	t=pre-dose, 0.5, 1, 2, 4, 8, 16, 24, 32, 48, 72 hrs

Figure 38B

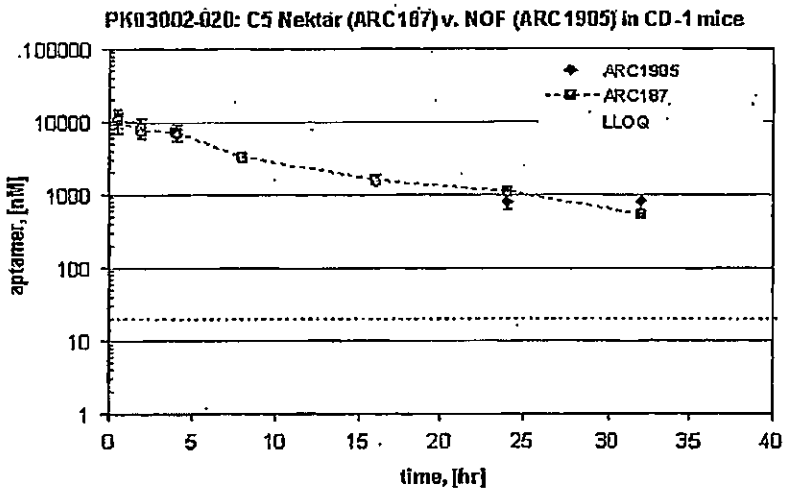


Figure 38C

Noncompartmental PK analysis (NCA)			
Attribute	Unit	ARC1905	ARC187
Cmax	µM	12	10
AUC0-∝	µM·hr	88	89
MRT0-∞	hr	11	11
CL	mL/min·kg	0.15	0.15
Vss	mL/kg	95	96
K10	1/hr	0.151	0.121
t1/2 (K10)	hr	5	6

Figure 39

Aptamer	Pre	1hr	3hr	6hr
ARC657	No	Yes	Yes	Yes
ARC658	No	Yes	Yes	Yes
ARC187	No	Yes	Yes	Yes

Figure 40

Group Number	Number of Animals	Test Article	Dosage Level (mg/kg)	Dose Volume (mL/kg)	Dosing Regimen	Sample Collection
1	1	ARC657 20 kDa PEG	30	3	Intravenous bolus on Day 1	t= pre-dose, 1, 5, 10, 15, and 30 minutes and at 1, 2, 4, 6, 8, 12, 24, 48, 72, 96, and 192 hrs
2	1	ARC658 30 kDa PEG	30	3	Intravenous bolus on Day 1	t= pre-dose, 1, 5, 10, 15, and 30 minutes and at 1, 2, 4, 6, 8, 12, 24, 48, 72, 96, and 192 hrs
3	1	ARC187 40 kDa PEG	30	3	Intravenous bolus on Day 1	t= pre-dose, 1, 5, 10, 15, and 30 minutes and at 1, 2, 4, 6, 8, 12, 24, 48, 72, 96, and 192 hrs

Figure 41

PK of Anti-C5 Aptamer -PEG Conjugates in Cynomolgus Macaque			
Aptamer	ARC657	ARC658	ARC187
PEG Group	20 kDa	30 kDa	40 kDa
	MEAN	MEAN	MEAN
time (hrs)	Cp (μM)	Cp (μM)	Cp (μM)
0	0.00	0.00	0.00
0.08	16.41	21.99	18.00
0.25	16.64	22.67	17.26
0.5	19.38	26.16	24.17
1	19.36	27.08	21.79
4	7.73	14.16	21.69
8	2.03	6.02	16.68
12	1.10	3.04	13.11
24	0.36	0.95	7.24
48	0.15	0.42	2.30
72	0.07	0.25	0.96
96	0.03	0.23	0.54
192	0.01	0.04	0.14

Figure 42

Species	Dose (mg/kg)	Admin Route	PEG Group	C_{max} (μg/ml)	$AUC_{0-\infty}$ (μg·hr/mL)	$t_{1/2}$ (α) (hr)	$t_{1/2}$ (β) (hr)	Cl (mL/min/kg)	V_{ss} (mL/kg)
primate	30	IV	20kD	293	1191	2.35	31.80	0.41	273
primate	30	IV	30kD	385	2484	3.33	40.08	0.20	233
primate	30	IV	40kD	316	6752	12.38	60.11	0.07	141

Figure 43

Figure 43a [sC5b-9] vs time

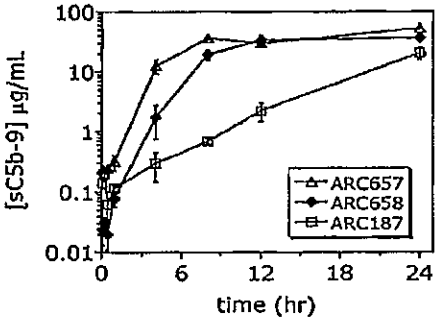


Figure 43b [sC5b-9] vs [aptamer]

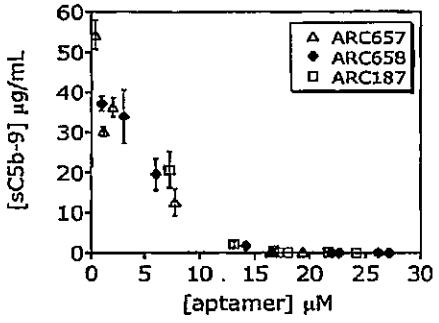


Figure 43c [C5a] vs time

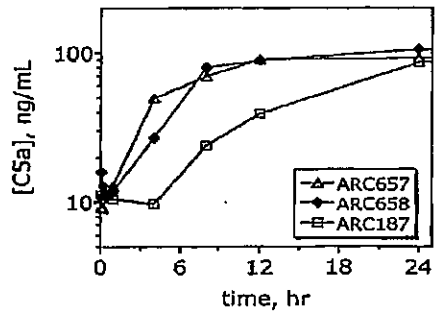


Figure 43d [C5a] vs [aptamer]

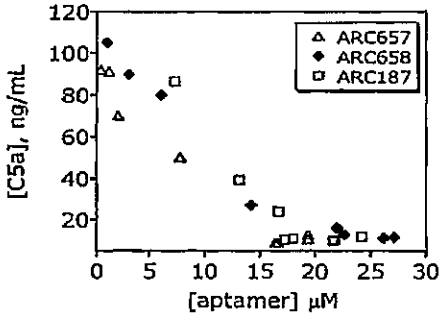


Figure 44

Group Number	Number of Animals	Test Article	Dosage Level (mg/kg)	Dose Volume (mL/kg)	Dosing Regimen	Sample Collection
1	4	ARC658 30 kDa PEG	30	3	Intravenous bolus on Day 1	t= pre-dose, 5, 10, 15, and 30 minutes and at 1, 2, 4, 6, 8, 12, 24, 48, 72, 96, 144 and 192 hrs
2	4	ARC187 40 kDa PEG	30	3	Intravenous bolus on Day 1	t= pre-dose, 5, 10, 15, and 30 minutes and at 1, 2, 4, 6, 8, 12, 24, 48, 72, 96, 144 and 192 hrs

Figure 45

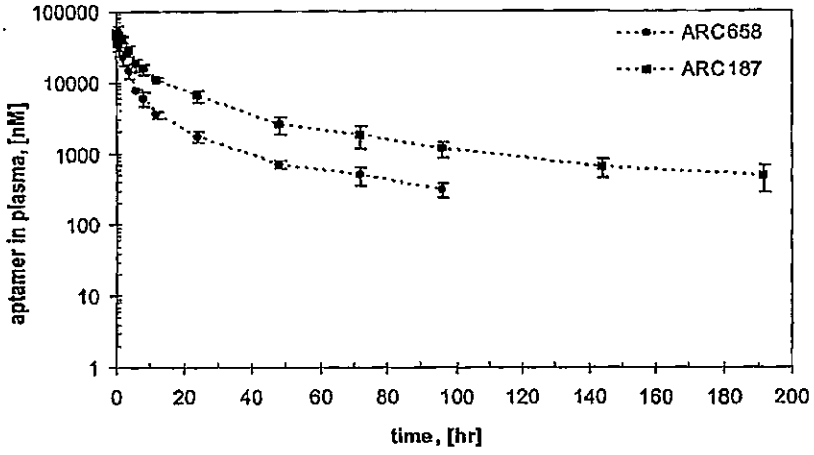

100000
10000
1000
100
10
1
aptamer in plasma, [nM]
0
20
40
60
80
100
120
140
160
180
200
time, [hr]
ARC658
ARC187

Figure 46

Species	Dose (mg/kg)	Admin Route	PEG Group	C_{max} (μM)	AUC (μg-hr/mL)	$t_{1/2}$ (α) (hr)	$t_{1/2}$ (β) (hr)	Cl (mL/min/kg)	V_{ss} (mL/kg)
primate	30	IV	30kD	519	3059	2.35	30.45	0.16	213
primate	30	IV	40kD	609	8061	4.48	53.13	0.06	168

Figure 47

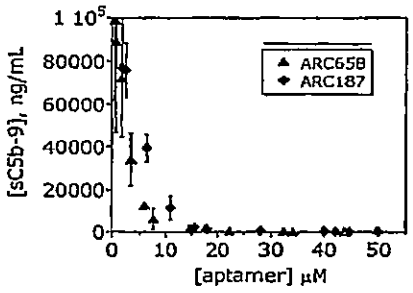


Figure 48

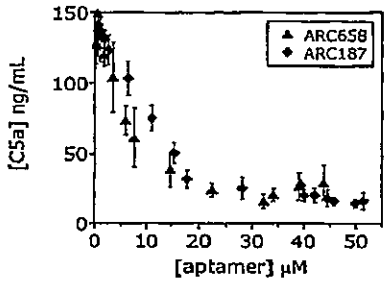


Figure 49

Gr. No.	No. of Animals	Test Article	Dosage Level (mg/kg)	Dose Conc. (mg/mL)	Dose Volume (mL/kg)	Dosing Regimen	Last Day on Test
1	3	ARC187	1 mg/kg IV bolus and 0.0013 mg/kg/min IV infusion	10	0.1 mL/kg, IV bolus and 0.1872 mL/kg/day, IV infusion	IV bolus and 48 hour infusion on Day 1	Day 8

Figure 50

Species	Dose (mg/kg)	Admin Route	PEG Group	C_{max} (µg/ml)	$AUC_{0-\infty}$ (µghr/mL)	$t_{1/2}$ (α) (hr)	$t_{1/2}$ (β) (hr)	Cl (mL/min/kg)	V_{ss} (mL/kg)
primate	30	IV	40kD	610	8061	4.48	53.13	0.06	168

Figure 51

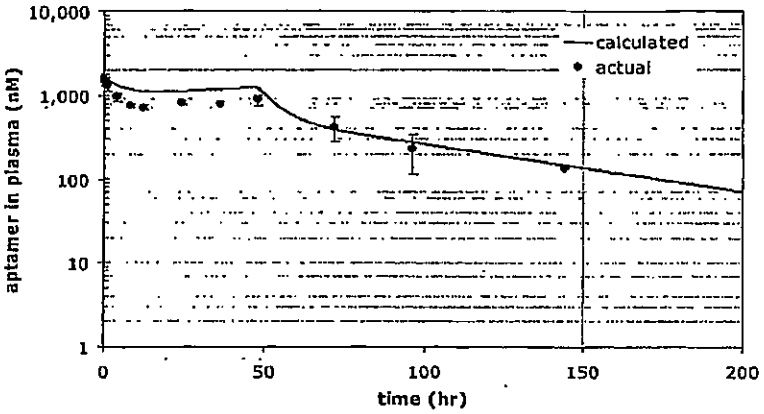

10,000
1,000
100
10
1
aptamer in plasma (nM)
0
50
100
150
200
time (hr)
calculated
actual

Figure 52

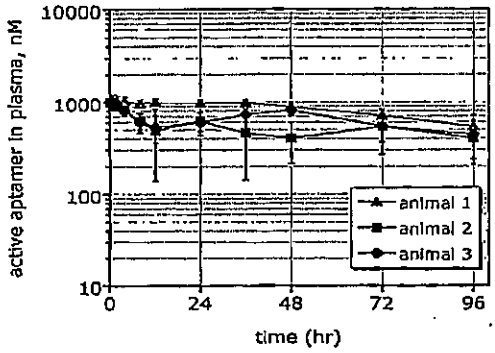


Figure 53

Aptamer	PEG Group	Mol. Wt. (oligo)	Mol. Wt. (total)	$t_{1/2}$ (α) (hr)	$t_{1/2}$ (β) (hr)	Total (oligo) Dose for 1.5 μM (g)
ARC187	40 kDa	12,703	52,703	4.48	53.13	0.40

Figure 54

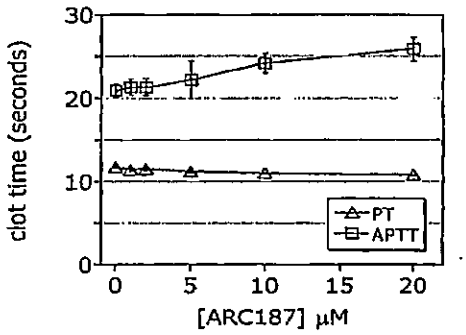


Figure 55

treatment	ACT (seconds)		
	Donor 1[a]	Donor 2[b]	Donor 3[b]
baseline	133 ± 30	145 ± 12	138 ± 1
+ heparin	842 ± 95	519 ± 16	450 ± 15
+ heparin & ARC187	nd	618 ± 55	492 ± 28
+ heparin & protamine	160 ± 11	155 ± 6	159 ± 9
+ heparin, protamine & ARC187	200 ± 5	172 ± 1	169 ± 8

[a]5 U/mL heparin; [b]4 U/mL heparin; nd, not determined

Figure 56

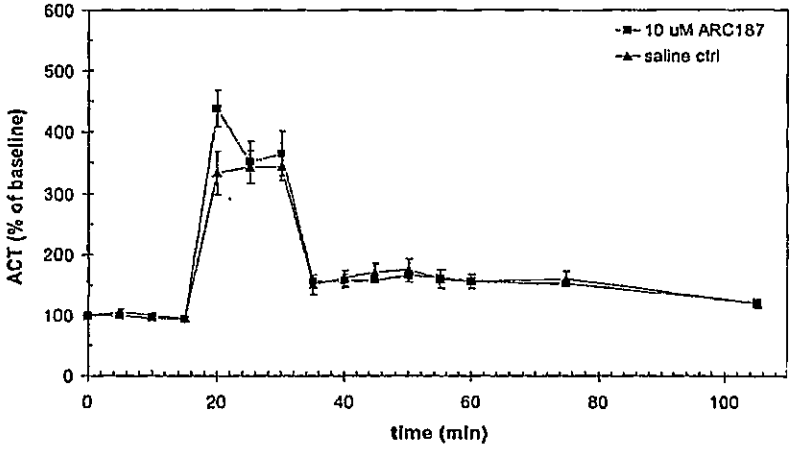

600
500
400
300
200
100
0
ACT (% of baseline)
0
20
40
60
80
100
time (min)
10 uM ARC187
saline ctrl

Figure 57

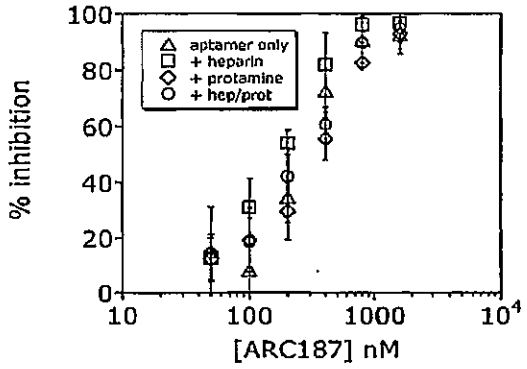

100
80
60
40
20
0
% inhibition
aptamer only
+ heparin
+ protamine
+ hep/prot
10
100
1000
10^4
[ARC187] nM

Figure 58

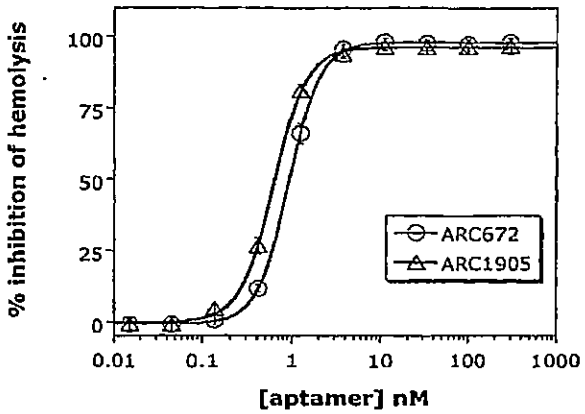

% inhibition of hemolysis
100
75
50
25
0
0.01
0.1
1
10
100
1000
[aptamer] nM
ARC672
ARC1905

Figure 59A

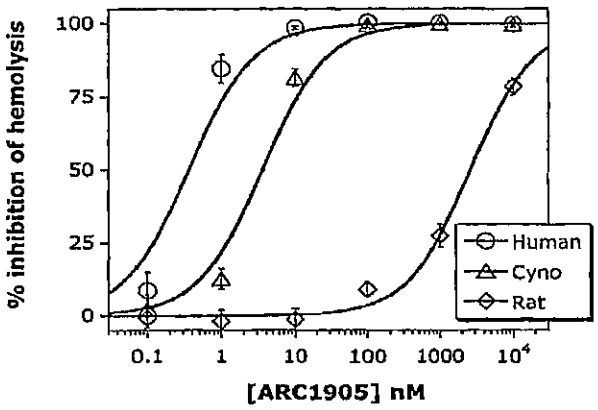


Figure 59B

Serum Species	ARC1905 IC_{50} (nM)	ARC127 IC_{50} (nM)
Human	0.349 ±0.0898	>10,000 NA
Cynomolgus Monkey	3.69 ±0.603	>10,000 NA
Rat	2700 ±470	~10,000 NA

Figure 60

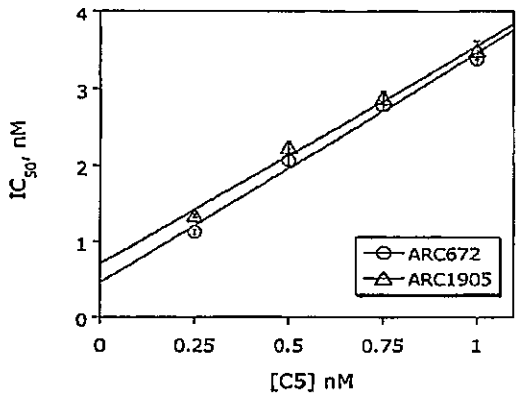


Figure 61

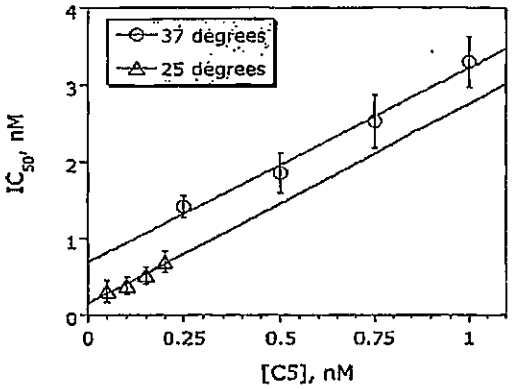


Figure 62

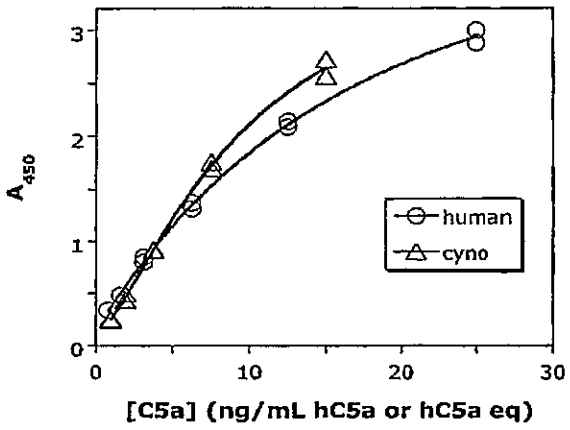


Figure 63

Aptamer	IC_{50} (nM)	IC_{90} (nM)	IC_{99} (nM)
Human	196	442	1090
	±13.9	±23.2	±198.0
Cynomolgus Macaque	536	1810	6900
	±54.7	±405.8	±2600
cyno/human ratio	2.73	4.1	6.4
	±0.339	±0.94	±2.65

Figure 64

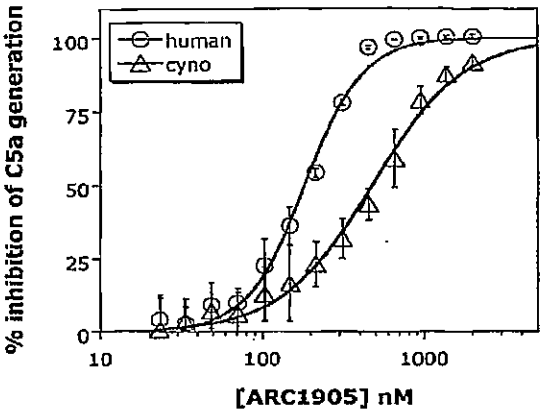

% inhibition of C5a generation
100
75
50
25
0
human
cyno
10
100
1000
[ARC1905] nM

Figure 65

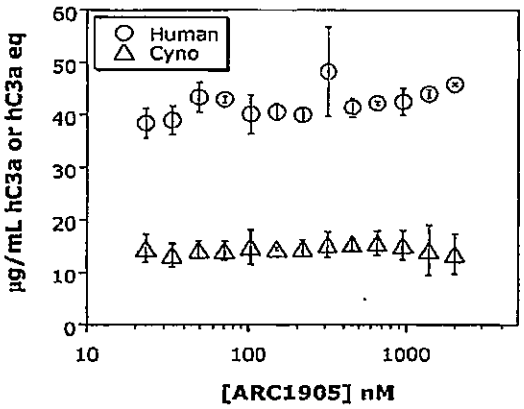
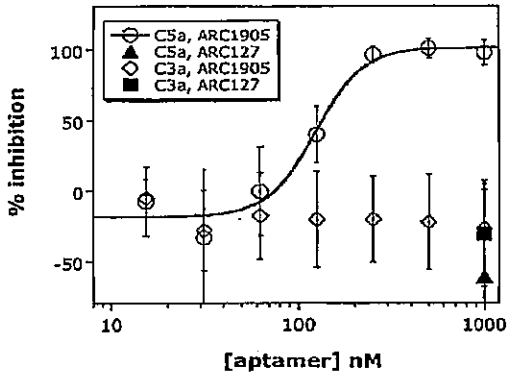


Figure 66

Donor	IC_{50} (nM)	IC_{90} (nM)	IC_{99} (nM)
Mean of 5 donors	119	268	694
SD	28.6	39.2	240.9

Figure 67


C5a, ARC1905
C5a, ARC127
C3a, ARC1905
C3a, ARC127
100
50
0
-50
% inhibition
10
100
1000
[aptamer] nM