FIGURE 1

MDGIAKEWGFASRSAYSRDILAMESFSTYIGNQFTRTEKLQTQTGNDSMKFNYNGI
SQFSSVRNRSSSSTLDKLGFKSSGTNLNLRYANNSILADSLFGIQYNISDSPIDKYGF
KDIYQKDNLTLYENQYSLPIAVASQSVYNDVKFNEHTLDNQASFLNQLANVNFDYFS
PIPYEKTEKIENTNDLISVTSSSNEDAAIQYQIEVPENSQVYLSFINLHFSNDKQKKV
DILVNGEKKTFTTDNVFSFFNLGYTKEKKTFNINVSFPGNSQVSFESPTFYRLDTKTF
TEAIQKIKEQPVTVSTSKNKVFATYDVQQDTSIFFTIPYDKGWSAYQDGKKIEIKQA
QTGFMKVDIPKGGSG

FIGURE 2

MSFDGFFLHHIVEELRSELVNGRIQKINQPFEQELVLQIRSNRQSHRLLLSAHPVFGR
IQLTQTTFENPAQPSTFIMVLRKYLQGALIESIEQVENDRIVEITVSNKNEIGDHIQAT
LIIEIMGKHSNILLVDKSSHKILEVIKHVGFSQNSYRTLLPGSTYIAPPSTKSLNPFTIK
DEKLFEILQTQELTAKNLQSLFQGLGRDTANELERILVSEKLSAFRNFFNQETKPCLTE
TSFSPVPFANQVGEPFANLSDLLDTYYKDKAERDRVKQQASELIRRVENELQKNRHK
LKKQEKELLATDNAEEFRQKGELLTTFLHQVPNDQDQVILDNYYTNQPIMIALDKALT
PNQNAQRYFKRYQKLKEAVKYLTDLIEETKATILYLESVETVLNQAGLEEIAEIREELIQ
TGFIRRRQREKIQKRKKLEQYLASDGKTIIYVGRNNLQNEELTFKMARKEELWFHAK
DIPGSHVVISGNLDPSDAVKTDAAELAAYFSQGRLSNLVQVDMIEVKKLNKPTGGKP
GFVTYTGQKTLRVTPDSKKIASMKKSGSG

FIGURE 3

MDKLKYYQGYTLSTTMVYDRGEGEETEKLEDKQIQLDLKKVEIKNIKETSLMNVDAE
GNETDKSLLSEKPTDVSQLYLRVTTHDNKVTRLAVSSVEEVVVDGKTLYKVVAKAPD
LVQRRADDTLSEEYVHYFEKQLPKVNNVYYNFNELVKDMQANPMGEFKLGADLNAV
NVKPAGKAYVMAKFRGTLSSVENHQYTIHNLERPLFNEAEGATLKNFNLGNVNINMP
WADKVAPIGNMFKKSTLENIKVVGSVTGNNDVTGAVNKLDEANMRNVAFIGKINSL
GDKGWWSGGLVSESWRSNTDSVYFDGDIVGNNSKFGGLVAKVNHGSNQWDVK
QKGRLTNSVVKGTMTLKNHGQSGGLVHENYDWGWVENNISMMKVNNGEIMYGS
GSIDGDPYFGFDYFKNNYYVKDVATGESTYKRSKQIQSISQAEADAKIANMGITANT
FAIQDPVVNKLNRIIDRDSEYKAIQDYQETRNLAYRNLEKLQPFYNKEWIVNQGNKL
TDESNLVKKTVLSVTGMKSGQFVTDLSSVDKIMIHYADGTKEEFGVSAISDSRVKQ
VKEYNVDDLGVVYTPNMVDKNRDSLITKVKEKLSSVALDSAEVKSITNNPASLYLEE
SFAEVRETLDKLVKSLLENEDHQLNSDEVAEKALLKKVEDNKAKIILALTYLNRYYGI
DYDGLNFKHLMMFKPDFYGKTPSILDFLIRIGSAEKNLKGDRSLEAYREVIGGTIGKG
ELNGLLGYNMRLFTKYTDLNDWFIHAAKNVYVSEPETTTEDFKDKRHRIYDGLNNDV
HGRMILPLLNLKKAHIFVISTYNTIAFSSFEKYGKNTEEERNAYKAEIDRVAKAQQRYL
DFWSRLALPKVRNQLLKSQNSVPTPVWDNQVYVGLGGANRMGYGDGGRVVTPVR
ELFGPTDRWHQINWNMGAMAKIYERPWKDDQVYFMVTNMMEPFGISAFTHETTHV
NDRMAYYGGDWHREGTDLEAFAQGMLQTPDKSTTNGEYGALGINMAYERKNDGE
QLYNYDPEKLDSREKIDSYMKNYNESMMMLDYLEASAVIRQNLSDNSKWFKKMDK
EWRTNADRNRLIGEPHQWDKLRDLTEEEKKLPIDSIDKLVENNFVTLHGMPKNGRY
RTEGFDSSYQPVNMMAGVFGGNTSKSTVGSISFKHNAFRMWGYYGYENGFIPYVS
NKLKGAANKENKGLLGDDFIIKKVSKNQFQNLEEWKKHWYHEVYDKAQKGFVEIEV
DGVKISTYAQLQSLFEEAVSKDLAGMDDKNIKNHYQYTENLKWKIYKQLLKNTDGF
SSDLFTAPQAGSG

FIGURE 4

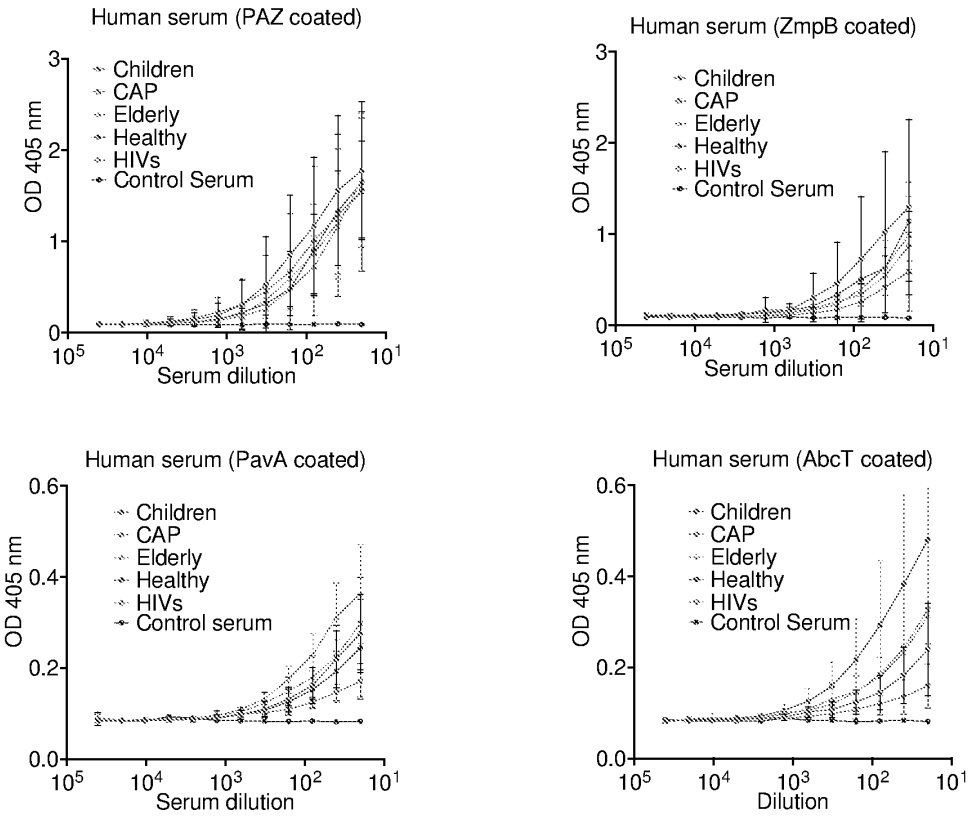

Human serum (PAZ coated)
Children
CAP
Elderly
Healthy
HIVs
Control Serum
OD 405 nm
Serum dilution
Human serum (ZmpB coated)
Children
CAP
Elderly
Healthy
HIVs
Control Serum
OD 405 nm
Serum dilution
Human serum (PavA coated)
Children
CAP
Elderly
Healthy
HIVs
Control serum
OD 405 nm
Serum dilution
Human serum (AbcT coated)
Children
CAP
Elderly
Healthy
HIVs
Control Serum
OD 405 nm
Dilution

FIGURE 5

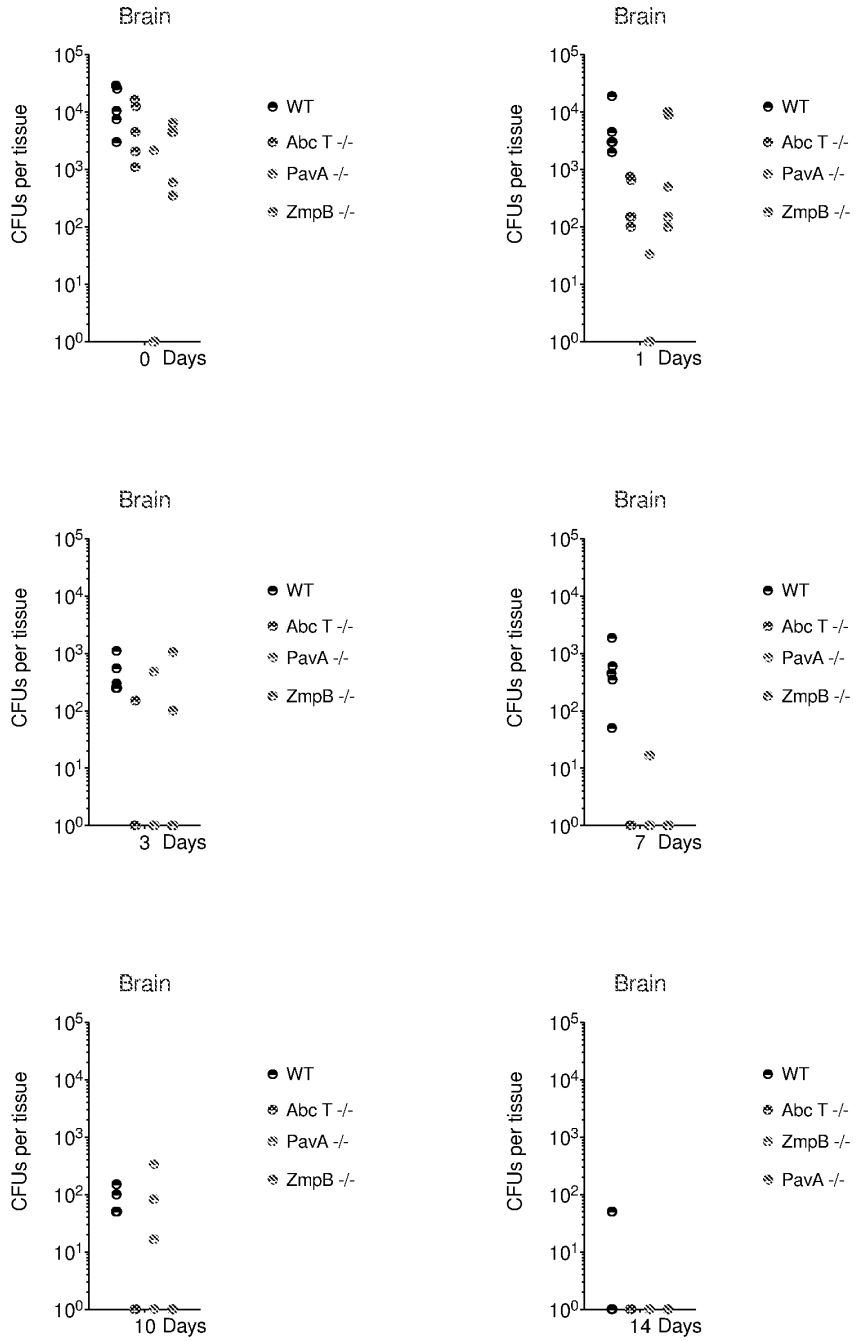

Brain
CFUs per tissue
10^5
10^4
10^3
10^2
10^1
10^0
0 Days
1 Days
3 Days
7 Days
10 Days
14 Days
WT
Abc T -/-
PavA -/-
ZmpB -/-

FIGURE 6A

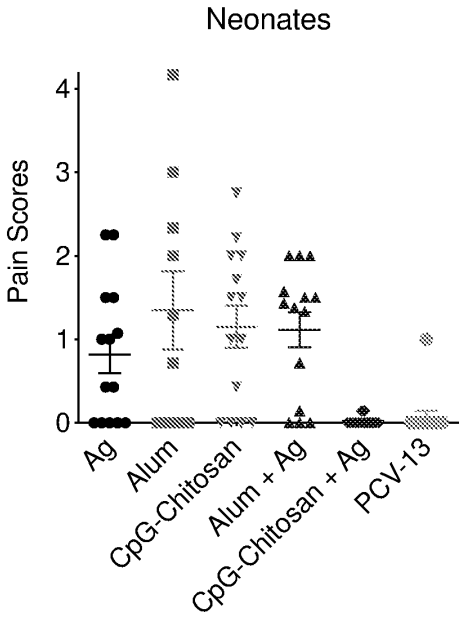


FIGURE 6B

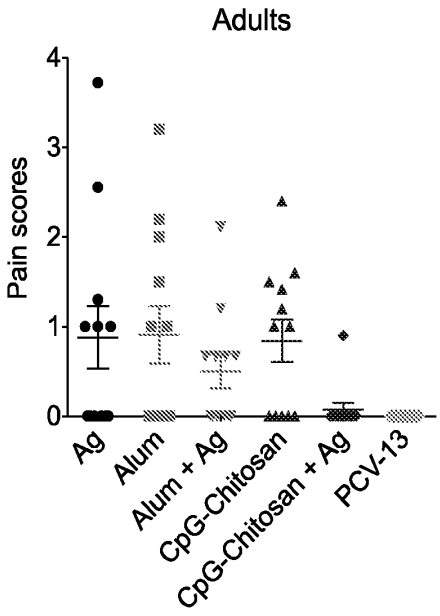


FIGURE 7

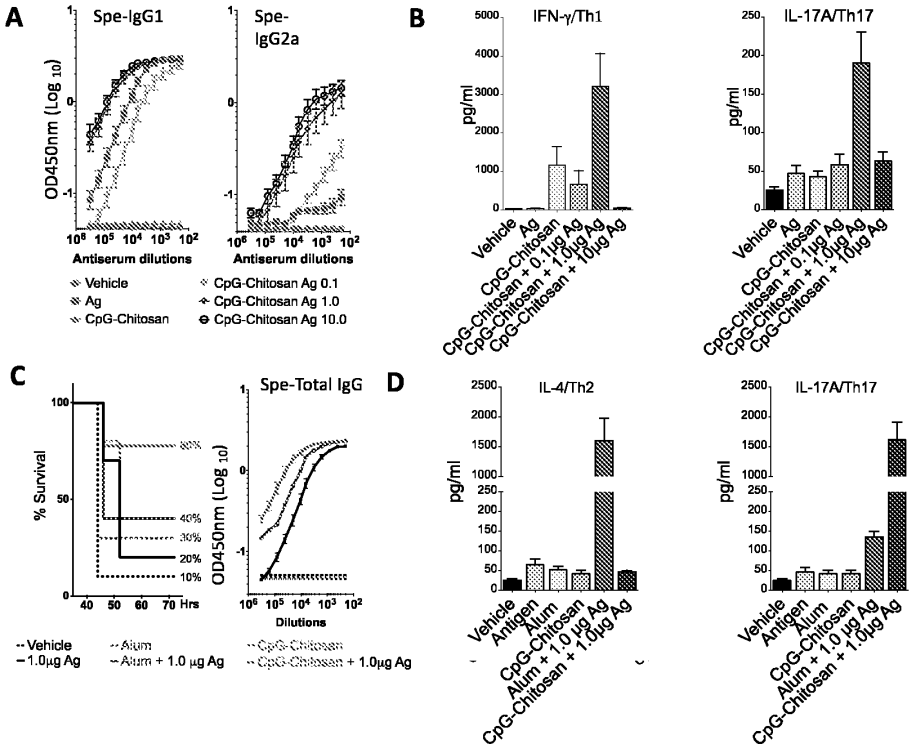

A
Spe-IgG1
Spe-IgG2a
OD450nm (Log 10)
Antiserum dilutions
Vehicle
Ag
CpG-Chitosan
CpG-Chitosan Ag 0.1
CpG-Chitosan Ag 1.0
CpG-Chitosan Ag 10.0
B
IFN-γ/Th1
IL-17A/Th17
pg/ml
Vehicle
Ag
CpG-Chitosan
CpG-Chitosan + 0.1µg Ag
CpG-Chitosan + 1.0µg Ag
CpG-Chitosan + 10µg Ag
C
% Survival
Hrs
80%
40%
30%
20%
10%
Spe-Total IgG
Dilutions
Vehicle
1.0µg Ag
Alum
Alum + 1.0 µg Ag
CpG-Chitosan
CpG-Chitosan + 1.0µg Ag
D
IL-4/Th2
IL-17A/Th17
Antigen
Alum
Alum + 1.0 µg Ag

FIGURE 8

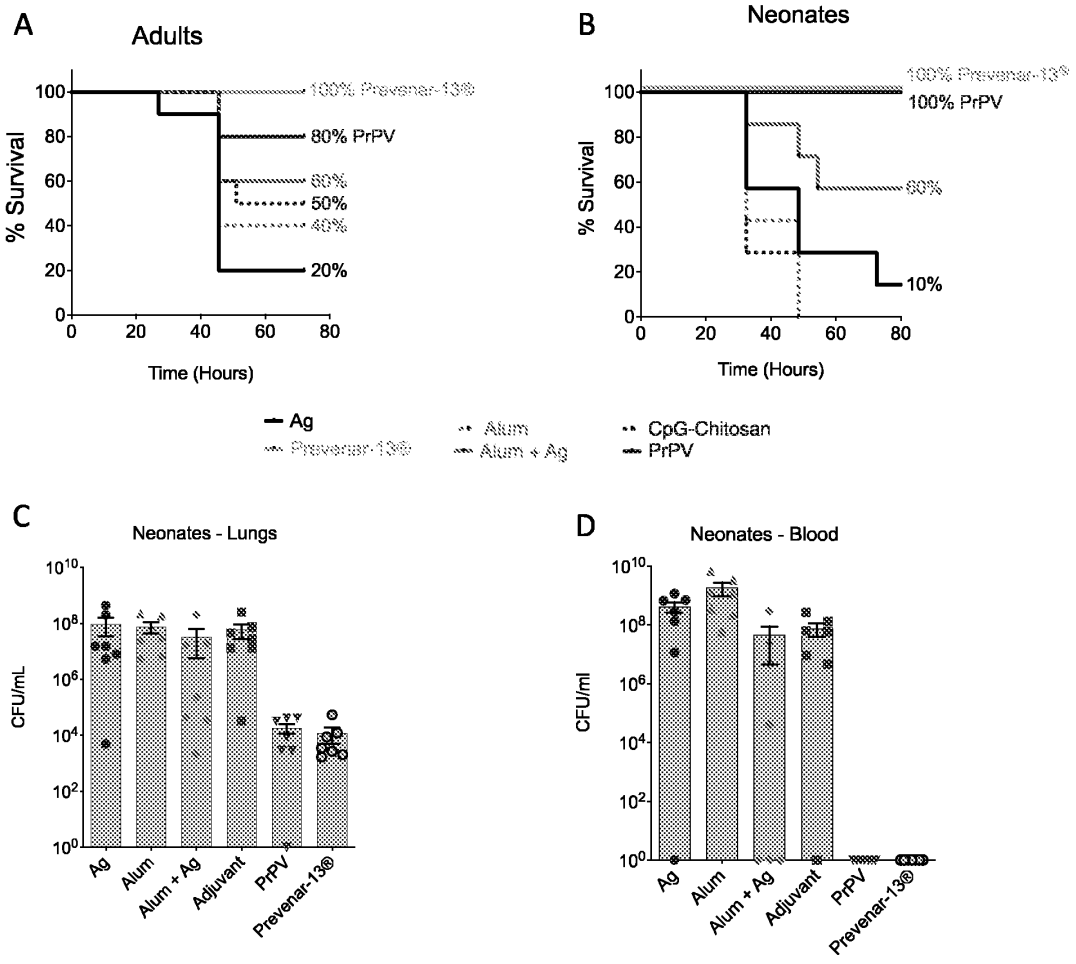

A
Adults
% Survival
Time (Hours)
100% Prevenar-13®
80% PrPV
60%
50%
40%
20%
B
Neonates
% Survival
Time (Hours)
100% Prevenar-13®
100% PrPV
60%
10%
Ag
Prevenar-13®
Alum
Alum + Ag
CpG-Chitosan
PrPV
C
Neonates - Lungs
CFU/mL
Ag
Alum
Alum + Ag
Adjuvant
PrPV
Prevenar-13®
D
Neonates - Blood
CFU/ml
Ag
Alum
Alum + Ag
Adjuvant
PrPV
Prevenar-13®

FIGURE 9

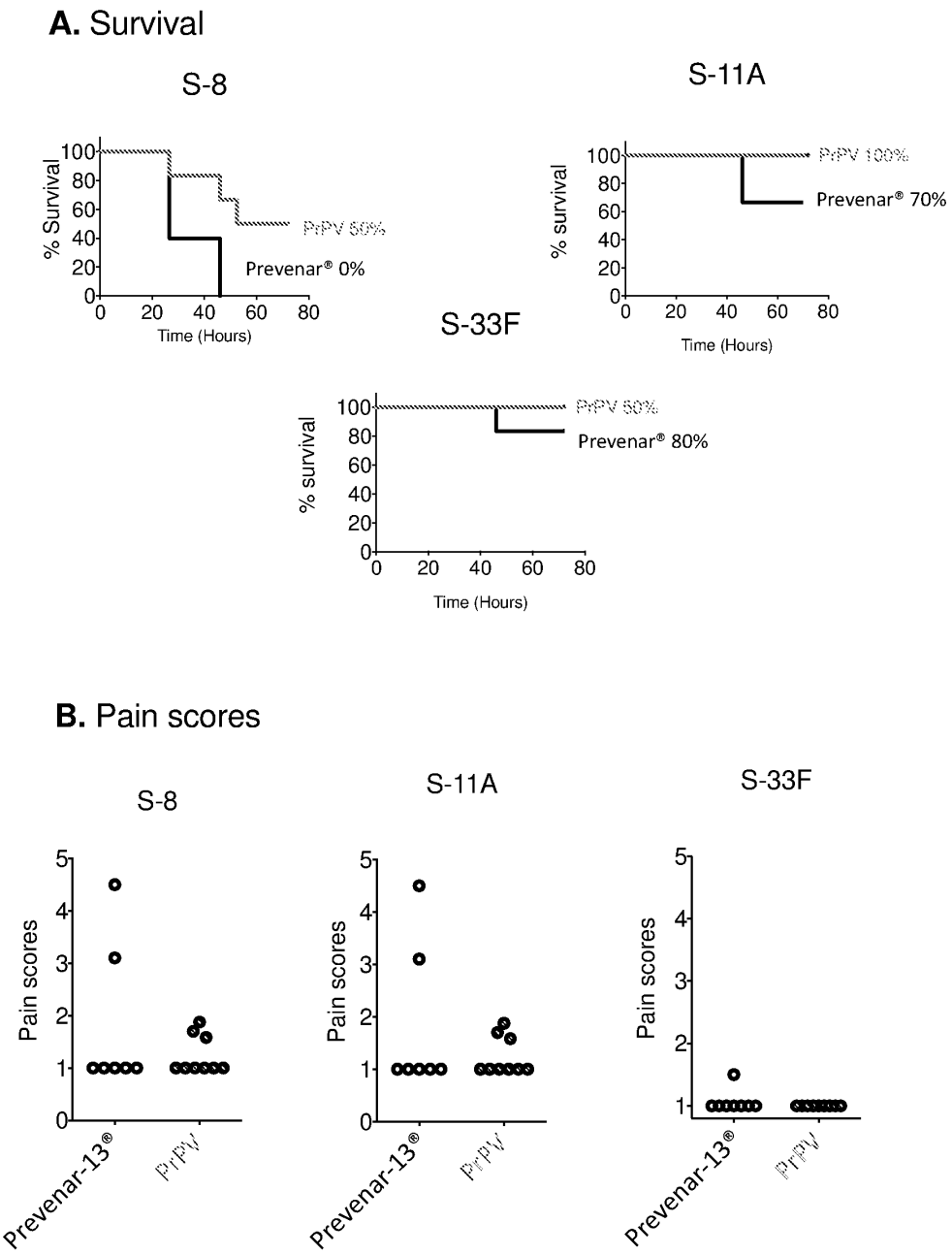

A. Survival
S-8
% Survival
100
80
60
40
20
0
0 20 40 60 80
Time (Hours)
PrPV 50%
Prevenar® 0%
S-11A
% survival
PrPV 100%
Prevenar® 70%
Time (Hours)
S-33F
% survival
PrPV 50%
Prevenar® 80%
Time (Hours)
B. Pain scores
S-8
S-11A
S-33F
Pain scores
5
4
3
2
1
0
Prevenar-13®
PrPV

FIGURE 10

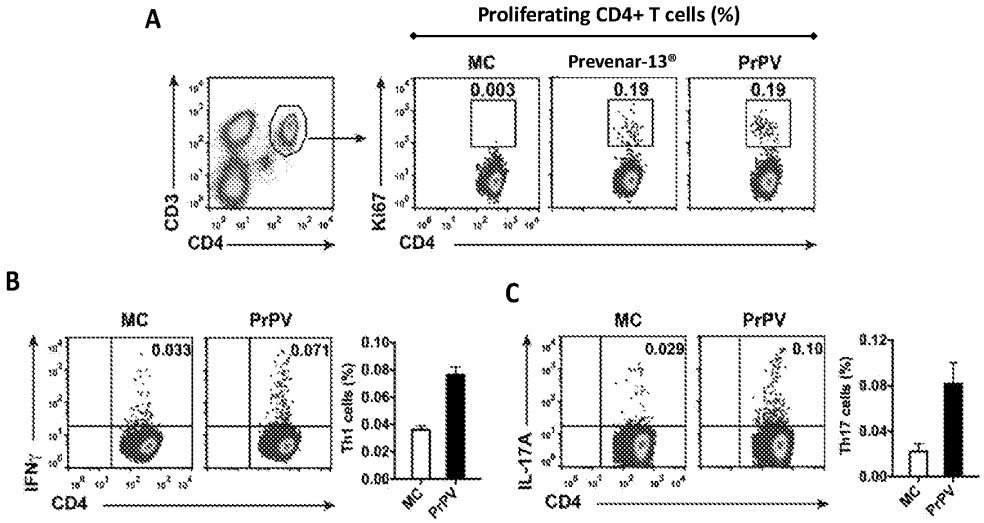


FIGURE 11

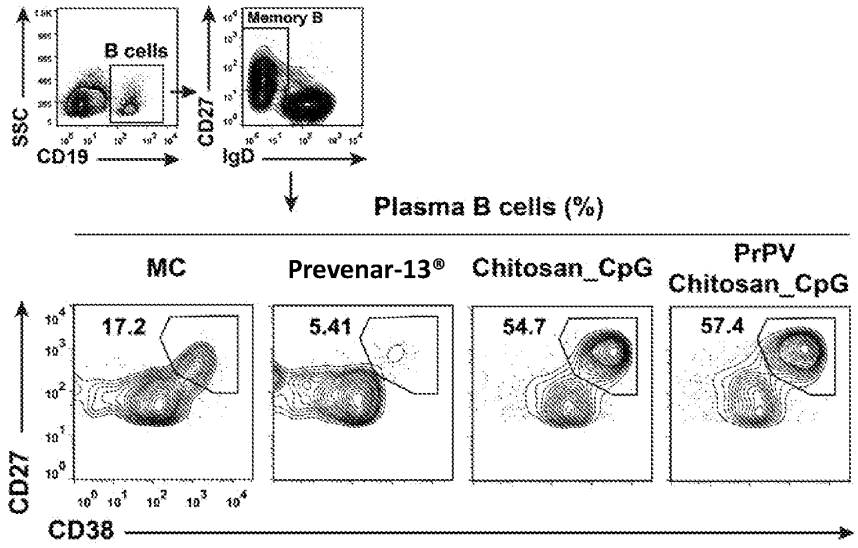


FIGURE 12A

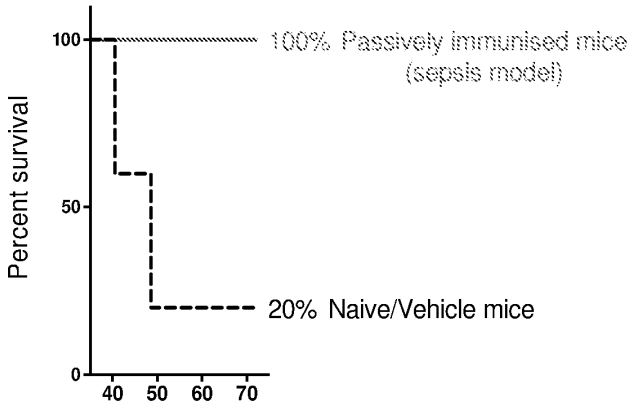


FIGURE 12B

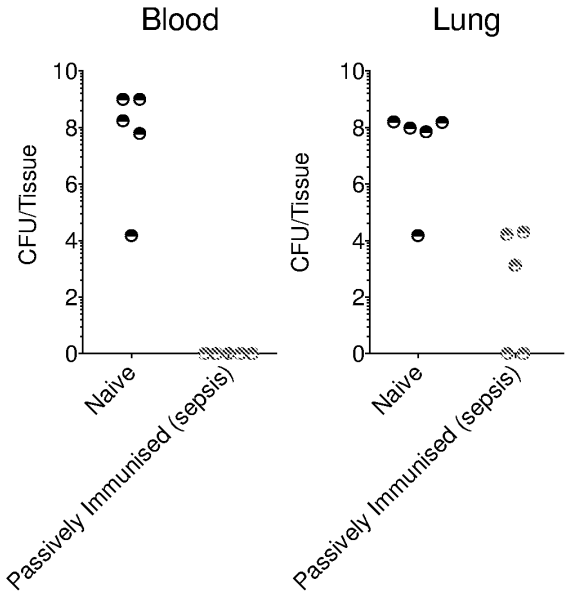


Figure 13A

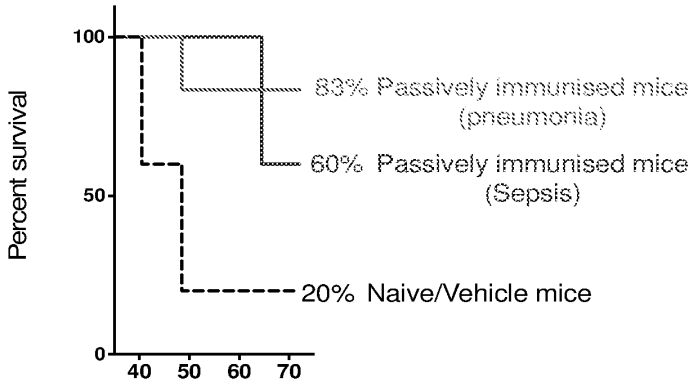


FIGURE 13B

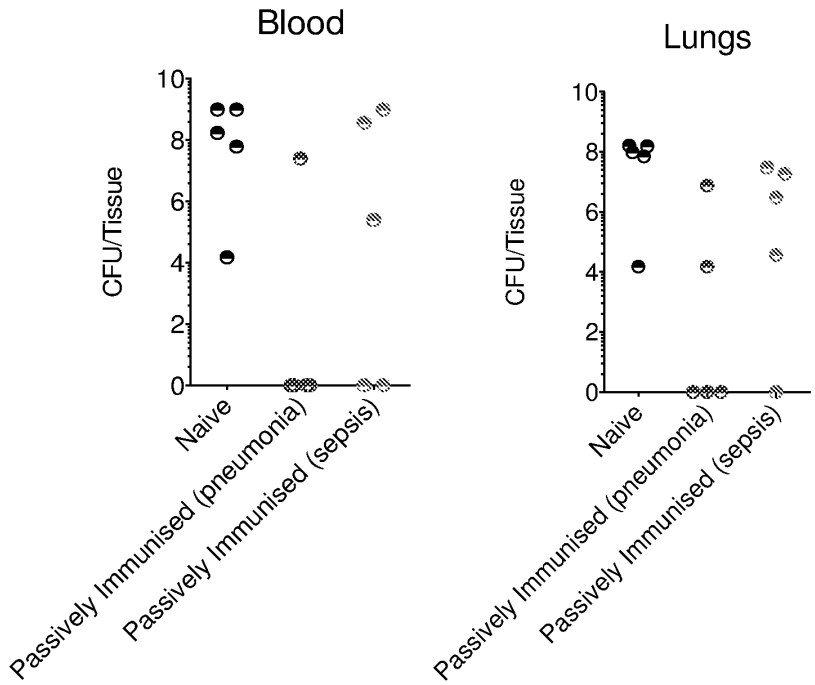


FIGURE 14

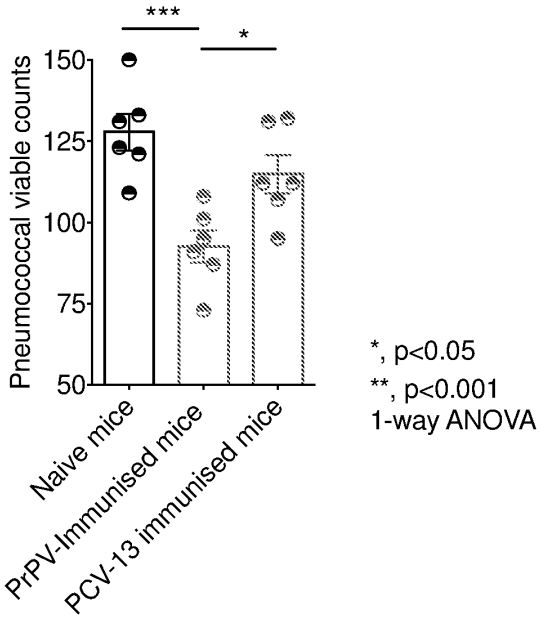

***
*
Pneumococcal viable counts
150
125
100
75
50
Naive mice
PrPV-Immunised mice
PCV-13 immunised mice
*, p<0.05
**, p<0.001
1-way ANOVA

FIGURE 15A

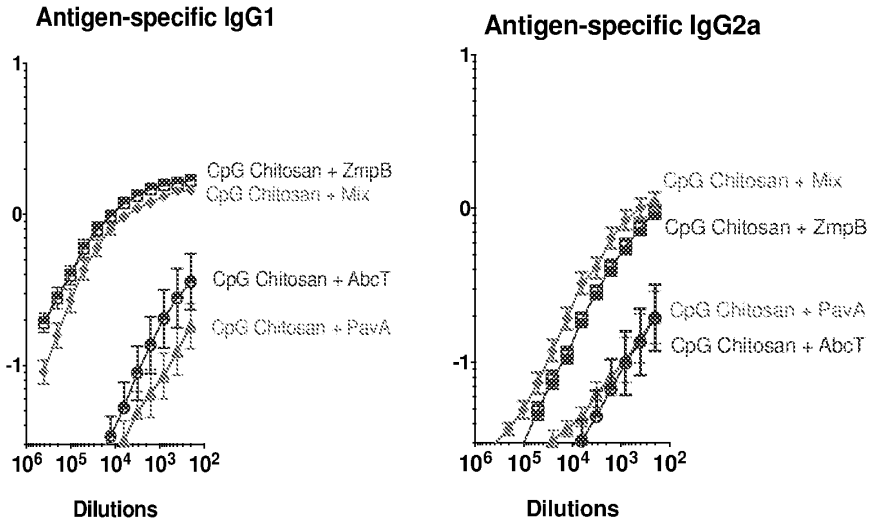


FIGURE 15B

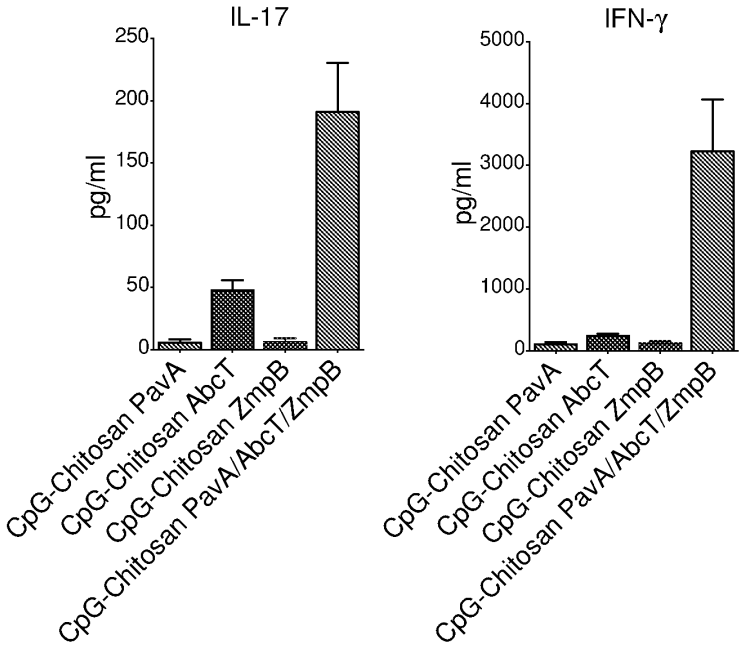


FIGURE 16A

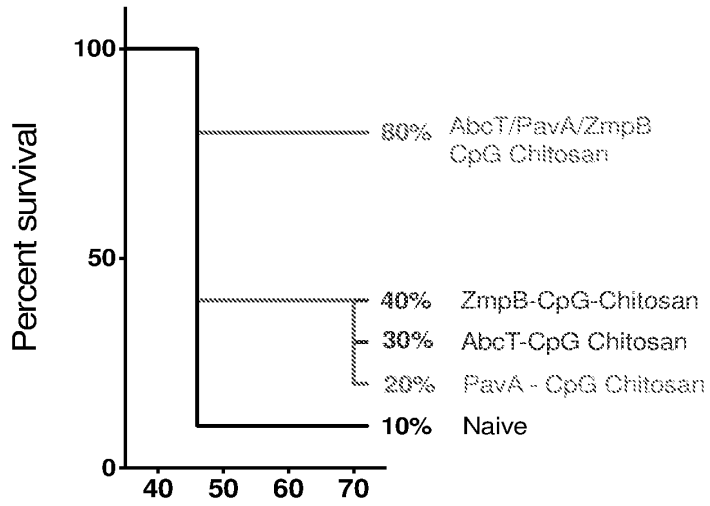


FIGURE 16B

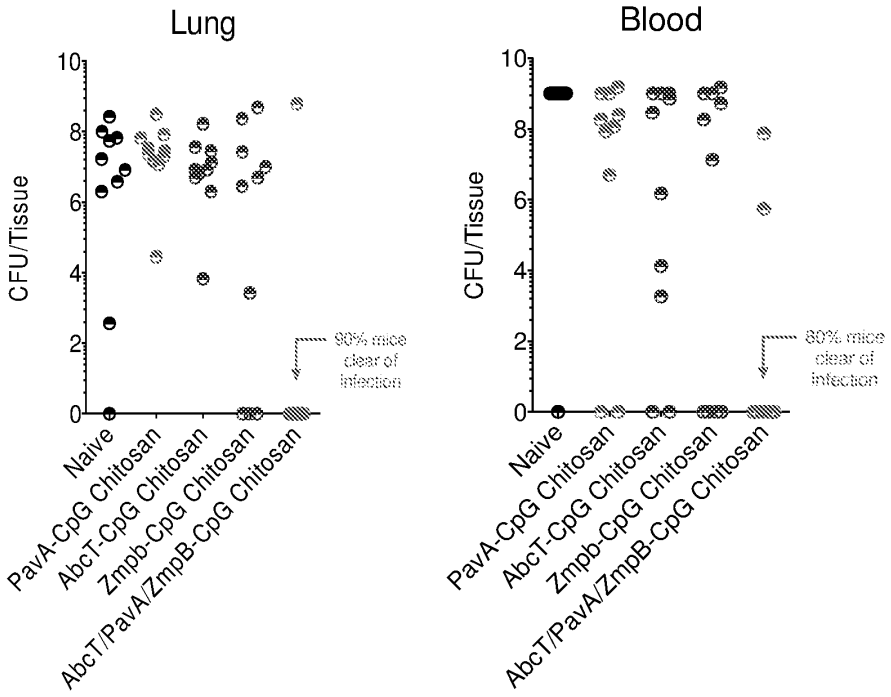


FIGURE 17

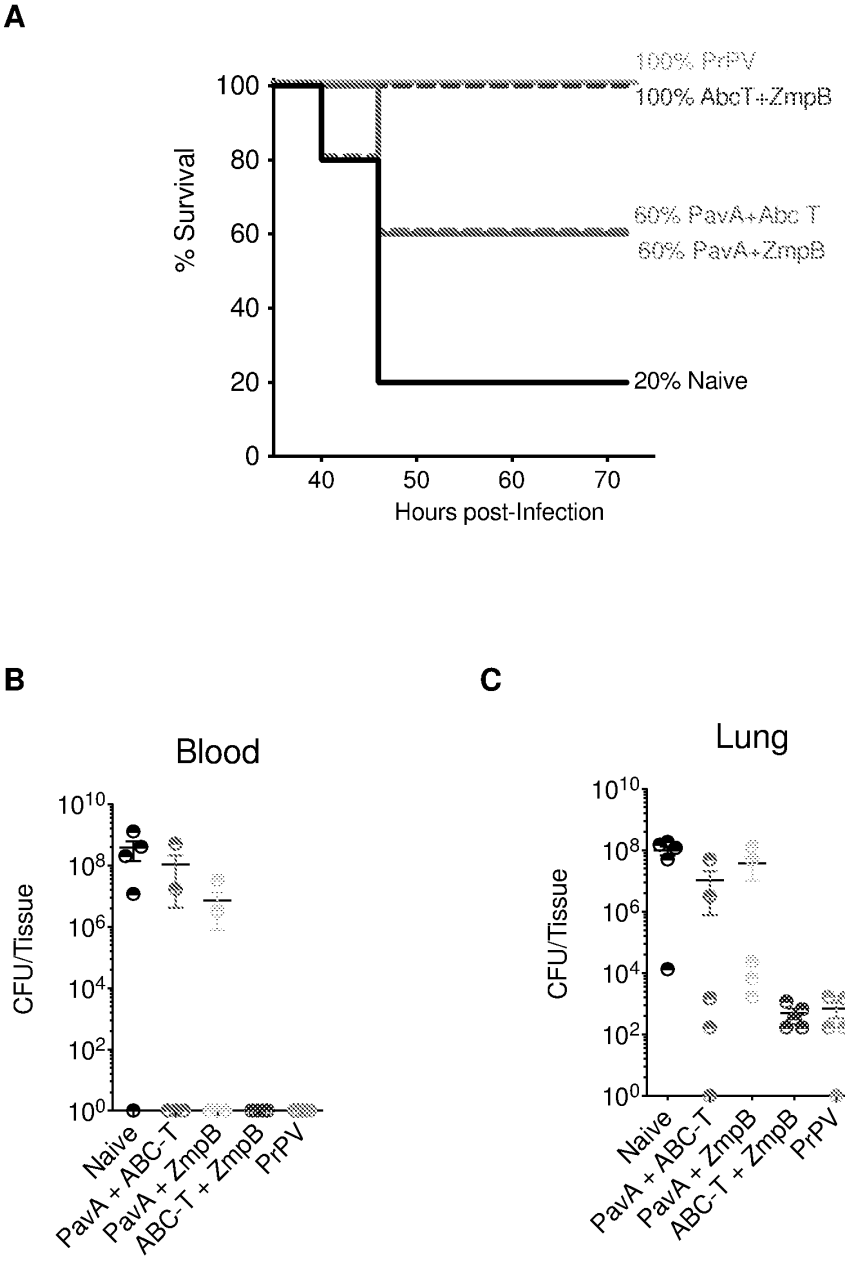

A
100% PrPV
100% AbcT+ZmpB
60% PavA+Abc T
60% PavA+ZmpB
20% Naive
% Survival
Hours post-Infection
B
Blood
CFU/Tissue
C
Lung
CFU/Tissue
Naive
PavA + ABC-T
PavA + ZmpB
ABC-T + ZmpB
PrPV

FIGURE 18

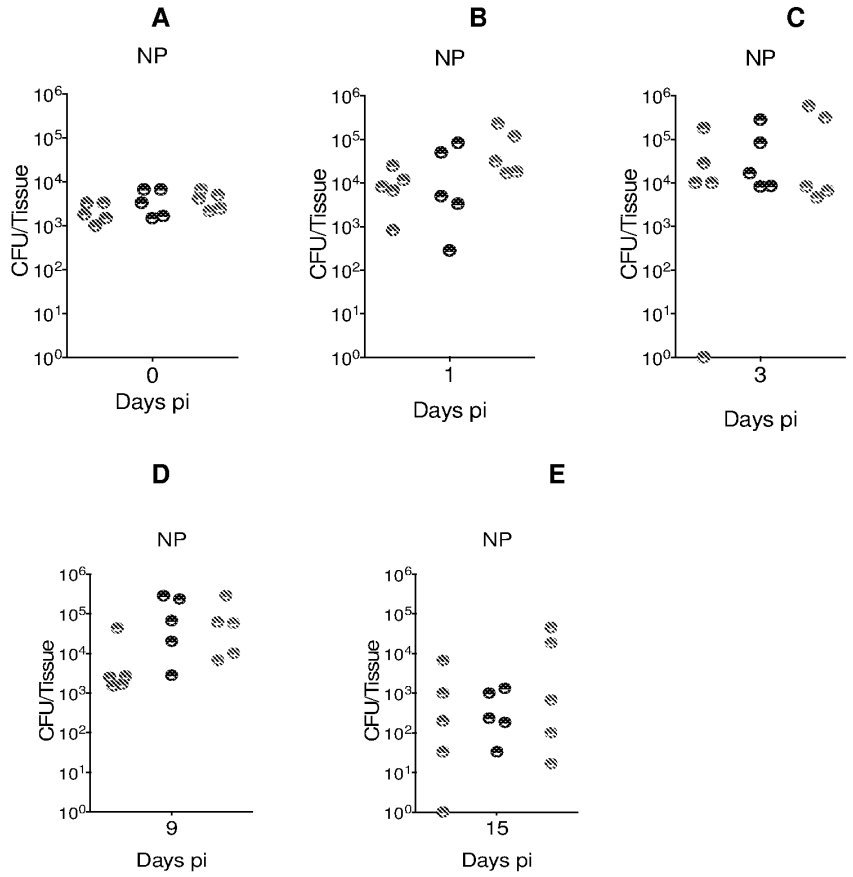

A
NP
CFU/Tissue
10^6
10^5
10^4
10^3
10^2
10^1
10^0
0
Days pi
B
NP
CFU/Tissue
1
Days pi
C
NP
CFU/Tissue
3
Days pi
D
NP
CFU/Tissue
9
Days pi
E
NP
CFU/Tissue
15
Days pi

FIGURE 19

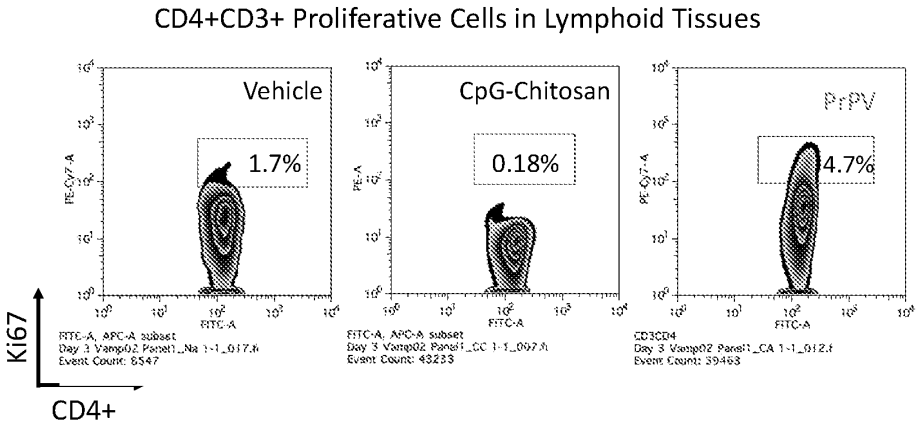

CD4+CD3+ Proliferative Cells in Lymphoid Tissues
Vehicle
1.7%
CpG-Chitosan
0.18%
PrPV
4.7%
Ki67
CD4+

FIGURE 20

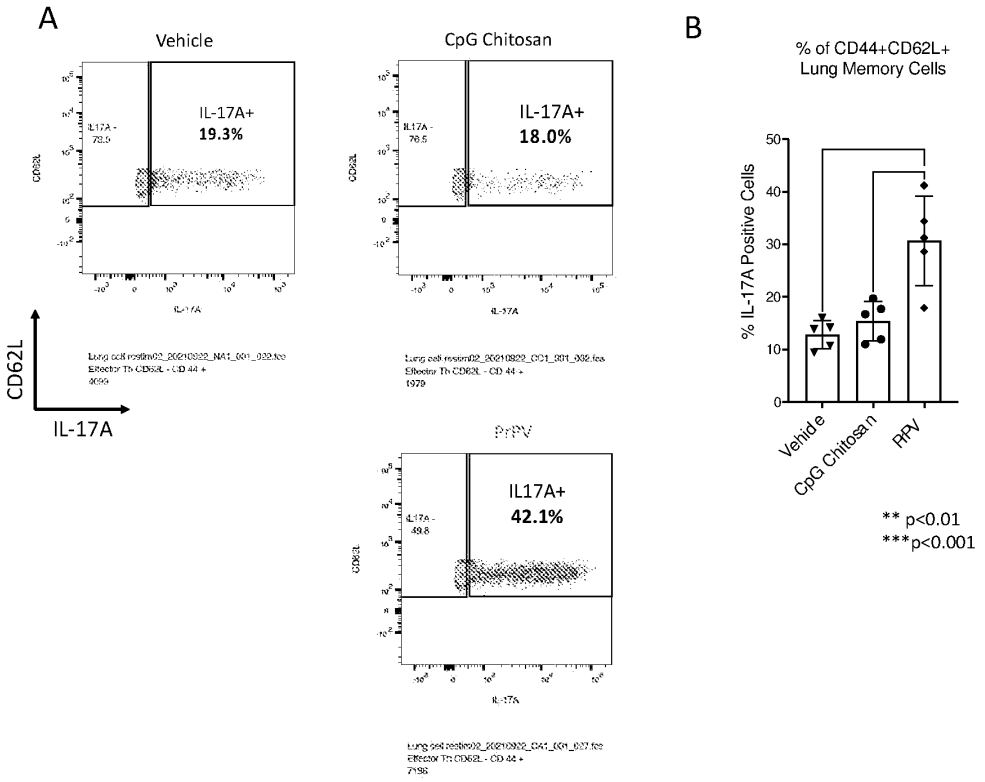

A
Vehicle
IL-17A+
19.3%
CpG Chitosan
IL-17A+
18.0%
PrPV
IL17A+
42.1%
CD62L
IL-17A
B
% of CD44+CD62L+
Lung Memory Cells
% IL-17A Positive Cells
Vehicle
CpG Chitosan
PPV
** p<0.01
***p<0.001

FIGURE 21

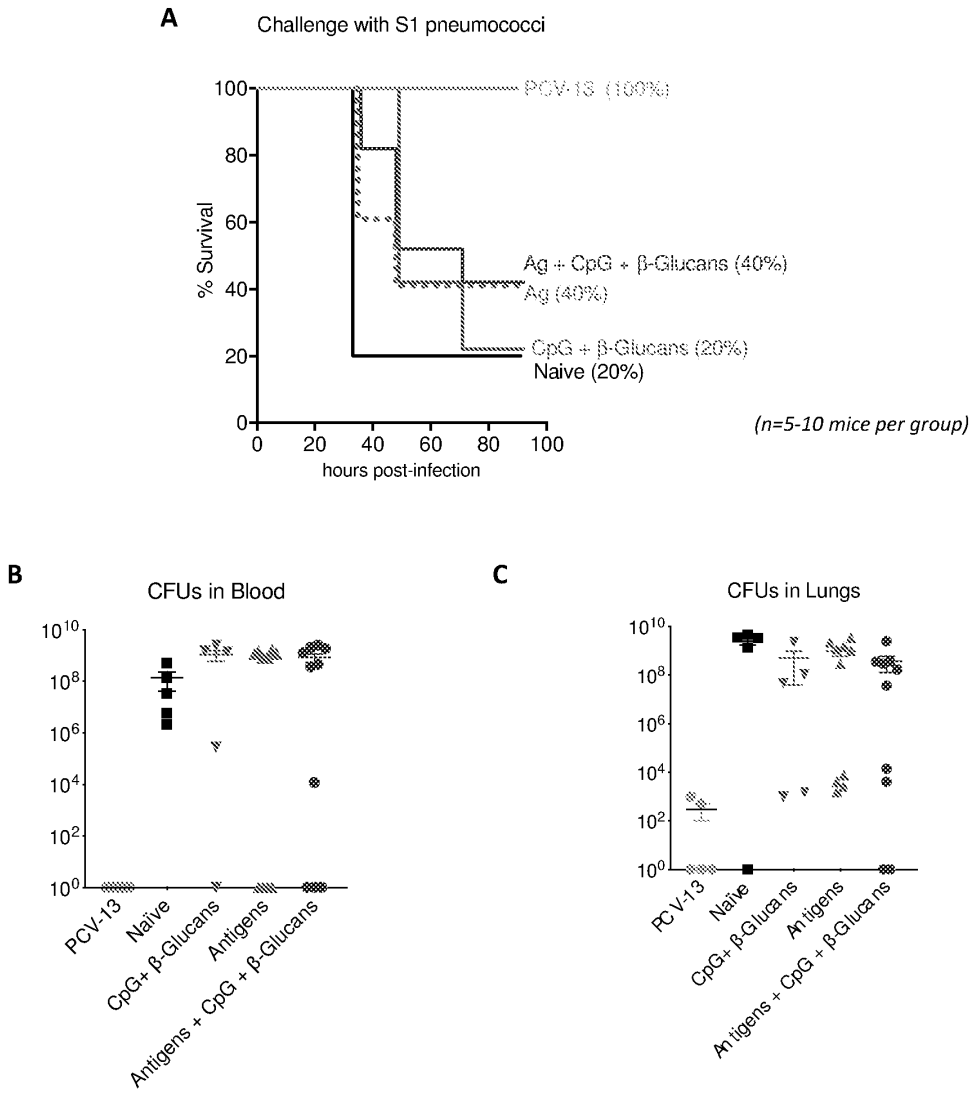

A
Challenge with S1 pneumococci
% Survival
hours post-infection
PCV-13 (100%)
Ag + CpG + β-Glucans (40%)
Ag (40%)
CpG + β-Glucans (20%)
Naive (20%)
(n=5-10 mice per group)
B
CFUs in Blood
PCV-13
Naive
CpG+ β-Glucans
Antigens
Antigens + CpG + β-Glucans
C
CFUs in Lungs
PCV-13
Naive
CpG+ β-Glucans
Antigens
Antigens + CpG + β-Glucans

FIGURE 22

AUGGAUGGCAUUGCGAAAGAAUGGGGCUUUGCGAGCCGCAGCGCGUAUAGC
CGCGAUAUUCUGGCGAUGGAAAGCUUUAGCACCUAUAUUGGCAACCAGUUUA
CCCGCACCGAAAAACUGCAGACCCAGACCGGCAACGAUAGCAUGAAAUUUAA
CUAUAACGGCAUUAGCCAGUUUAGCAGCGUGCGCAACCGCAGCAGCAGCAGC
ACCCUGGAUAAACUGGGCUUUAAAAGCAGCGGCACCAACCUGAACCUGCGCU
AUGCGAACAACAGCAUUCUGGCGGAUAGCCUGUUUGGCAUUCAGUAUAACAU
UAGCGAUAGCCCGAUUGAUAAAUAUGGCUUUAAAGAUAUUUAUCAGAAAGAU
AACCUGACCCUGUAUGAAAACCAGUAUAGCCUGCCGAUUGCGGUGGCGAGC
CAGAGCGUGUAUAACGAUGUGAAAUUUAACGAACAUACCCUGGAUAACCAGG
CGAGCUUUCUGAACCAGCUGGCGAACGUGAACUUUGAUUAUUUUAGCCCGAU
UCCGUAUGAAAAAACCGAAAAAAUUGAAAACACCAACGAUCUGAUUAGCGUGA
CCAGCAGCAGCAACGAAGAUGCGGCGAUUCAGUAUCAGAUUGAAGUGCCGGA
AAACAGCCAGGUGUAUCUGAGCUUUAUUAACCUGCAUUUUAGCAACGAUAAA
CAGAAAAAAGUGGAUAUUCUGGUGAACGGCGAAAAAAAAACCUUUACCACCG
AUAACGUGUUUAGCUUUUUUAACCUGGGCUAUACCAAAGAAAAAAAAACCUUU
AACAUUAACGUGAGCUUUCCGGGCAACAGCCAGGUGAGCUUUGAAAGCCCGA
CCUUUUAUCGCCUGGAUACCAAAACCUUUACCGAAGCGAUUCAGAAAAUUAA
AGAACAGCCGGUGACCGUGAGCACCAGCAAAAACAAAGUGUUUGCGACCUAU
GAUGUGCAGCAGGAUACCAGCAUUUUUUUUACCAUUCCGUAUGAUAAAGGCU
GGAGCGCGUAUCAGGAUGGCAAAAAAAUUGAAAUUAAACAGGCGCAGACCGG
CUUUAUGAAAGUGGAUAUUCCGAAAGGCGGCAGCGGC

FIGURE 23

AUGAGCUUUGAUGGCUUUUUUCUGCAUCAUAUUGUGGAAGAACUGCGCAGC
GAACUGGUGAACGGCCGCAUUCAGAAAAUUAACCAGCCGUUUGAACAGGAAC
UGGUGCUGCAGAUUCGCAGCAACCGCCAGAGCCAUCGCCUGCUGCUGAGCG
CGCAUCCGGUGUUUGGCCGCAUUCAGCUGACCCAGACCACCUUUGAAAACCC
GGCGCAGCCGAGCACCUUUAUUAUGGUGCUGCGCAAAUAUCUGCAGGGCGC
GCUGAUUGAAAGCAUUGAACAGGUGGAAAACGAUCGCAUUGUGGAAAUUACC
GUGAGCAACAAAAACGAAAUUGGCGAUCAUAUUCAGGCGACCCUGAUUAUUG
AAAUUAUGGGCAAACAUAGCAACAUUCUGCUGGUGGAUAAAAGCAGCCAUAA
AAUUCUGGAAGUGAUUAAACAUGUGGGCUUUAGCCAGAACAGCUAUCGCACC
CUGCUGCCGGGCAGCACCUAUAUUGCGCCGCCGAGCACCAAAAGCCUGAAC
CCGUUUACCAUUAAAGAUGAAAAACUGUUUGAAAUUCUGCAGACCCAGGAAC
UGACCGCGAAAAACCUGCAGAGCCUGUUUCAGGGCCUGGGCCGCGAUACCG
CGAACGAACUGGAACGCAUUCUGGUGAGCGAAAAACUGAGCGCGUUUCGCAA
CUUUUUUAACCAGGAAACCAAACCGUGCCUGACCGAAACCAGCUUUAGCCCG
GUGCCGUUUGCGAACCAGGUGGGCGAACCGUUUGCGAACCUGAGCGAUCUG
CUGGAUACCUAUUAUAAAGAUAAAGCGGAACGCGAUCGCGUGAAACAGCAGG
CGAGCGAACUGAUUCGCCGCGUGGAAAACGAACUGCAGAAAAACCGCCAUAA
ACUGAAAAAACAGGAAAAAGAACUGCUGGCGACCGAUAACGCGGAAGAAUUU
CGCCAGAAAGGCGAACUGCUGACCACCUUUCUGCAUCAGGUGCCGAACGAUC
AGGAUCAGGUGAUUCUGGAUAACUAUUAUACCAACCAGCCGAUUAUGAUUGC
GCUGGAUAAAGCGCUGACCCCGAACCAGAACGCGCAGCGCUAUUUUAAACGC
UAUCAGAAACUGAAAGAAGCGGUGAAAUAUCUGACCGAUCUGAUUGAAGAAA

CCAAAGCGACCAUUCUGUAUCUGGAAAGCGUGGAAACCGUGCUGAACCAGGC
GGGCCUGGAAGAAAUUGCGGAAAUUCGCGAAGAACUGAUUCAGACCGGCUU
UAUUCGCCGCCGCCAGCGCGAAAAAAUUCAGAAACGCAAAAAACUGGAACAG
UAUCUGGCGAGCGAUGGCAAAACCAUUAUUUAUGUGGGCCGCAACAACCUGC
AGAACGAAGAACUGACCUUUAAAAUGGCGCGCAAAGAAGAACUGUGGUUUCA
UGCGAAAGAUAUUCCGGGCAGCCAUGUGGUGAUUAGCGGCAACCUGGAUCC
GAGCGAUGCGGUGAAAACCGAUGCGGCGGAACUGGCGGCGUAUUUUAGCCA
GGGCCGCCUGAGCAACCUGGUGCAGGUGGAUAUGAUUGAAGUGAAAAAACU
GAACAAACCGACCGGCGGCAAACCGGGCUUUGUGACCUAUACCGGCCAGAAA
ACCCUGCGCGUGACCCCGGAUAGCAAAAAAAUUGCGAGCAUGAAAAAAAGCG
GCAGCGGC

FIGURE 24

AUGGAUAAACUGAAAUAUUAUCAGGGCUAUACCCUGAGCACCACCAUGGUGU
AUGAUCGCGGCGAAGGCGAAGAAACCGAAAAACUGGAAGAUAAACAGAUUCA
GCUGGAUCUGAAAAAAGUGGAAAUUAAAAACAUUAAAGAAACCAGCCUGAUGA
ACGUGGAUGCGGAAGGCAACGAAACCGAUAAAAGCCUGCUGAGCGAAAAACC
GACCGAUGUGAGCCAGCUGUAUCUGCGCGUGACCACCCAUGAUAACAAAGUG
ACCCGCCUGGCGGUGAGCAGCGUGGAAGAAGUGGUGGUGGAUGGCAAAACC
CUGUAUAAAGUGGUGGCGAAAGCGCCGGAUCUGGUGCAGCGCCGCGCGGAU
GAUACCCUGAGCGAAGAAUAUGUGCAUUAUUUUGAAAAACAGCUGCCGAAAG
UGAACAACGUGUAUUAUAACUUUAACGAACUGGUGAAAGAUAUGCAGGCGAA
CCCGAUGGGCGAAUUUAAACUGGGCGCGGAUCUGAACGCGGUGAACGUGAA
ACCGGCGGGCAAAGCGUAUGUGAUGGCGAAAUUUCGCGGCACCCUGAGCAG
CGUGGAAAACCAUCAGUAUACCAUUCAUAACCUGGAACGCCCGCUGUUUAAC
GAAGCGGAAGGCGCGACCCUGAAAAACUUUAACCUGGGCAACGUGAACAUUA
ACAUGCCGUGGGCGGAUAAAGUGGCGCCGAUUGGCAACAUGUUUAAAAAAAG
CACCCUGGAAAACAUUAAAGUGGUGGGCAGCGUGACCGGCAACAACGAUGUG
ACCGGCGCGGUGAACAAACUGGAUGAAGCGAACAUGCGCAACGUGGCGUUU
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