

הילכו שניים יחדיו בלתי אם נועדו?
(עמוס ג:ג)



**It takes two to ...
develop community acquired
pneumonia in children-
The virus and the Bacteria**

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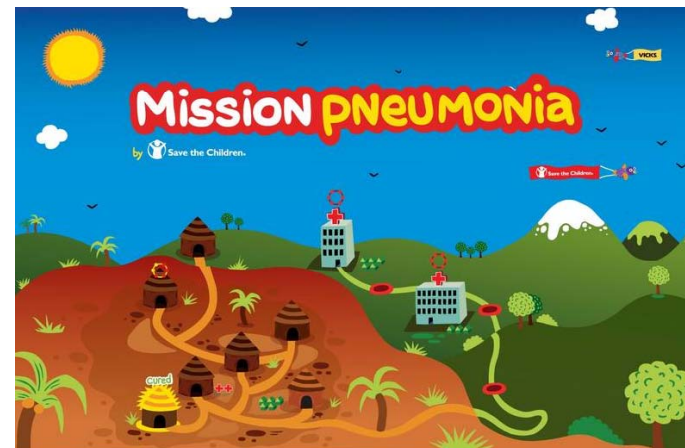
Outline

- The global problem of Pneumonia
- The global problem of viral infection the RSV example
- The role of RSV in community acquired pneumonia
- The co-infection paradigm
- Strategies to treat and prevent CAP in children
- New development in RSV treatment



Pneumonia in children the leading cause of morbidity and mortality

A child dies every 15 seconds from pneumonia



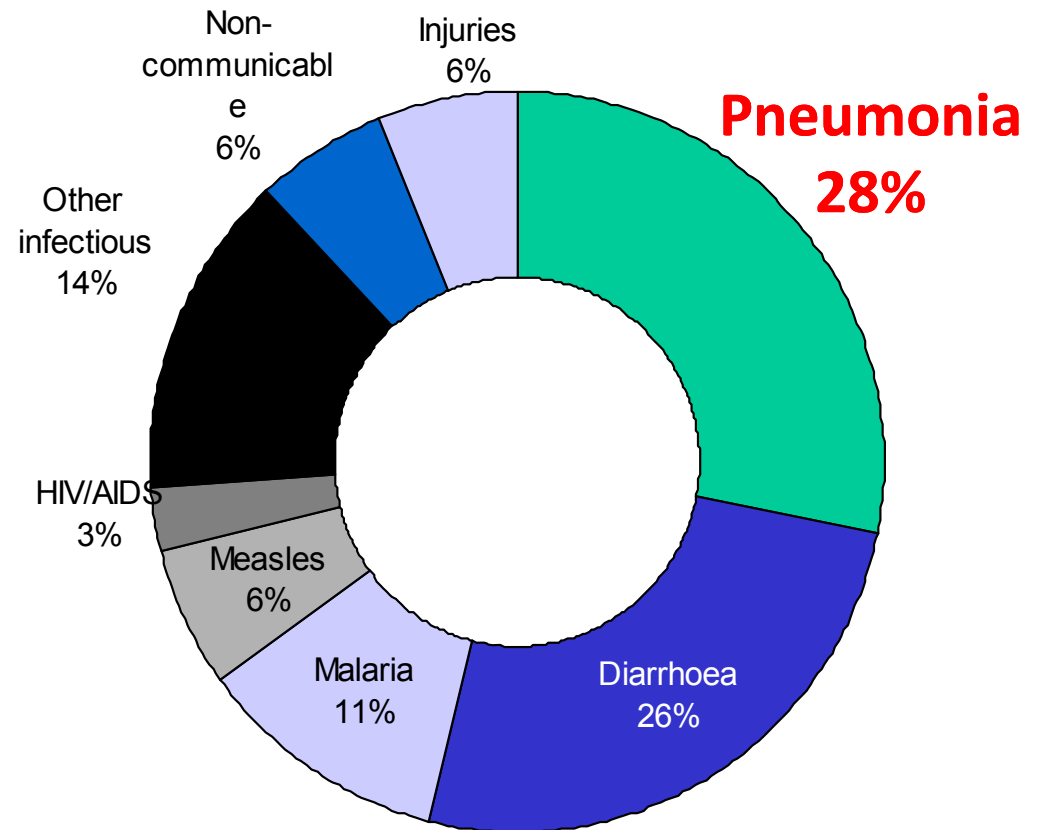
Global Action Plan for the Prevention and Control of Pneumonia (GAPP)

Thomas Cherian
Coordinator, EPI
On behalf of the GAPP Team

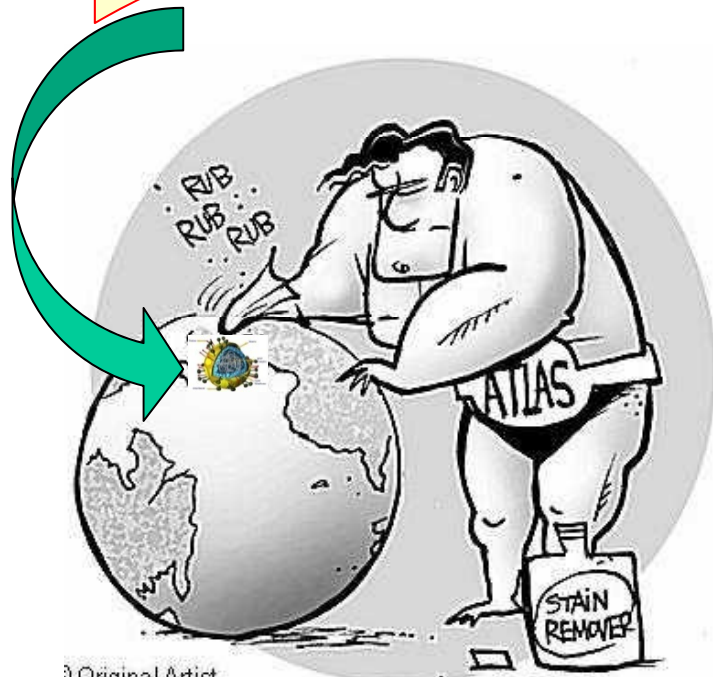


156 million cases of pneumonia and close to 1.8 million deaths occur in <5 years old children every year

Under 5 deaths (non-neonatal) ~6.5 m



The global problem of viral infection the RSV example



Background

The global problem of RSV

- 50% of children are infected with RSV by 1 year of age and almost all children have been infected by 2 years of age
- Among infants infected with RSV, 20-40% develop lower respiratory tract infection (LRTI), usually bronchiolitis or pneumonia
- Global RSV disease burden is estimated at **64 million** cases **3.4 million** episodes of severe RSV- ALRI necessitating hospital admission and **66,000–199,000 deaths** every year in children <5 years

*Hall CB. *N Engl J Med* 2001; 344: 1917-28.

*Glezen WP, *Am J Dis Child* 1986; 140(6): 543–546

Law BJ, *Resp Med* 2002; 96 (suppl B): S1-S7.

Henderson FW, *N Engl J Med* 1979; 300(10): 530-4.

Simoes EAF, *Resp Med* 2002; 96(suppl B): S16-S25

W.H.O http://www.who.int/vaccine_research/diseases/ari/en/index2.html#disease%20burden2

Hospitalization and Hospital Resource Utilization for RSV Disease – “Bronchiolitis”

High-risk group	Hospitalizations for RSV ^{1,2,3,4}	RSV hospitalizations leading to	
		ICU Admission ⁵⁻⁸	Ventilation ⁵⁻⁸
Term (³ 36 wks)	1%-3% ^{1, 2}	11% ⁵	4.6% ⁵
	x3-10	x2.5-3	x2.5-5
Premature (≤35 wks)	10.6% ³	28%-31% ⁵	12%-22% ⁵

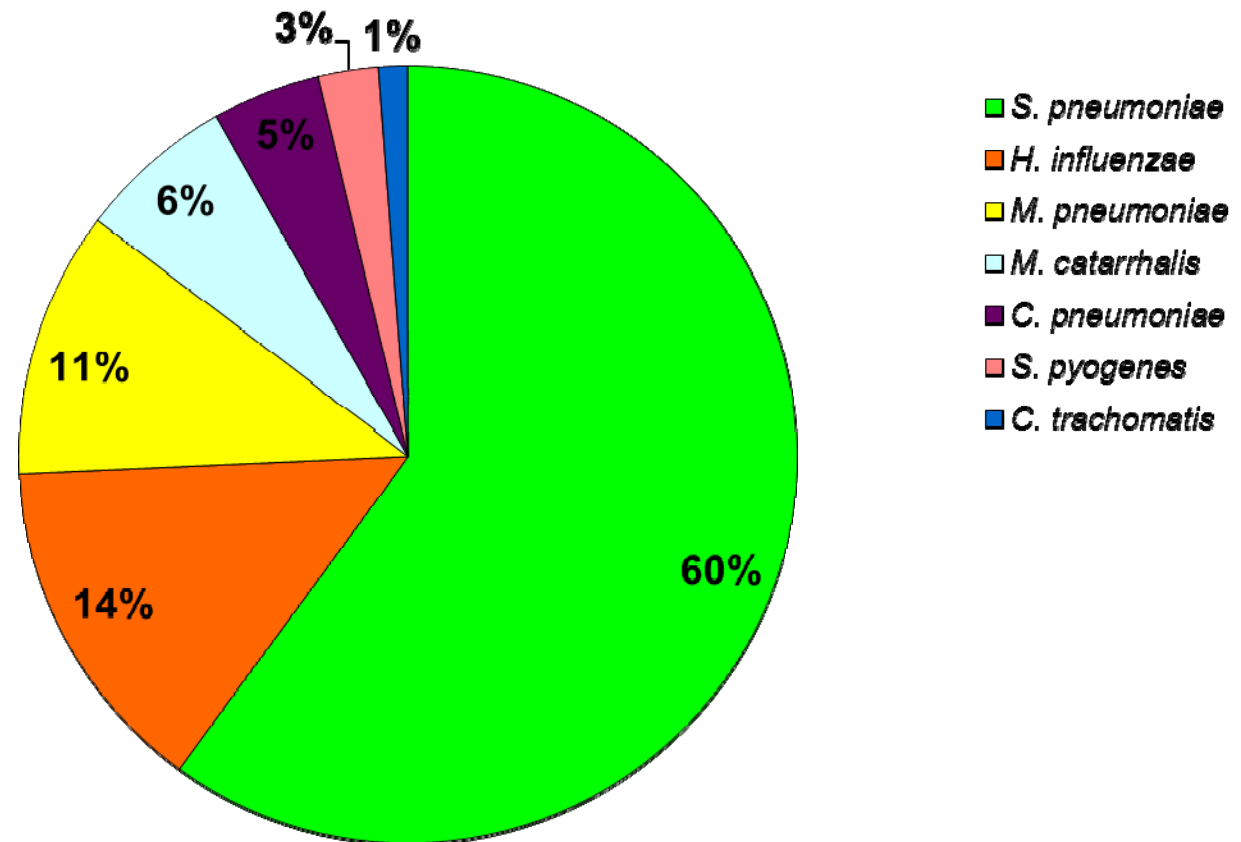
1. Shay DK et al. *JAMA*. 1999;282:1440-1446; 2. Hall CB.. In: Feigin RD, Cherry JD, eds. *Textbook of Pediatric Infectious Diseases*. 4th ed. Philadelphia, Pa: WB Saunders;1998:2084-2110; 3. The IMPact-RSV Study Group. *Pediatrics*. 1998;102:531-537; 4. Feltes TF et al. *J Pediatr*. 2003;143:532-540; 5. Law BJ et al. *Paediatr Child Health*. 1998;3:402-404; 6. Navas L et al. *J Pediatr*. 1992;121:348-354; 7. Altman CA et al. *Pediatr Cardiol*. 2000;21:433-438; 8. Moler FW et al. *Crit Care Med*. 1992;20:1406-1413.

The role of RSV in community acquired pneumonia



Bacteria in the Etiology of Childhood Community-acquired Pneumonia

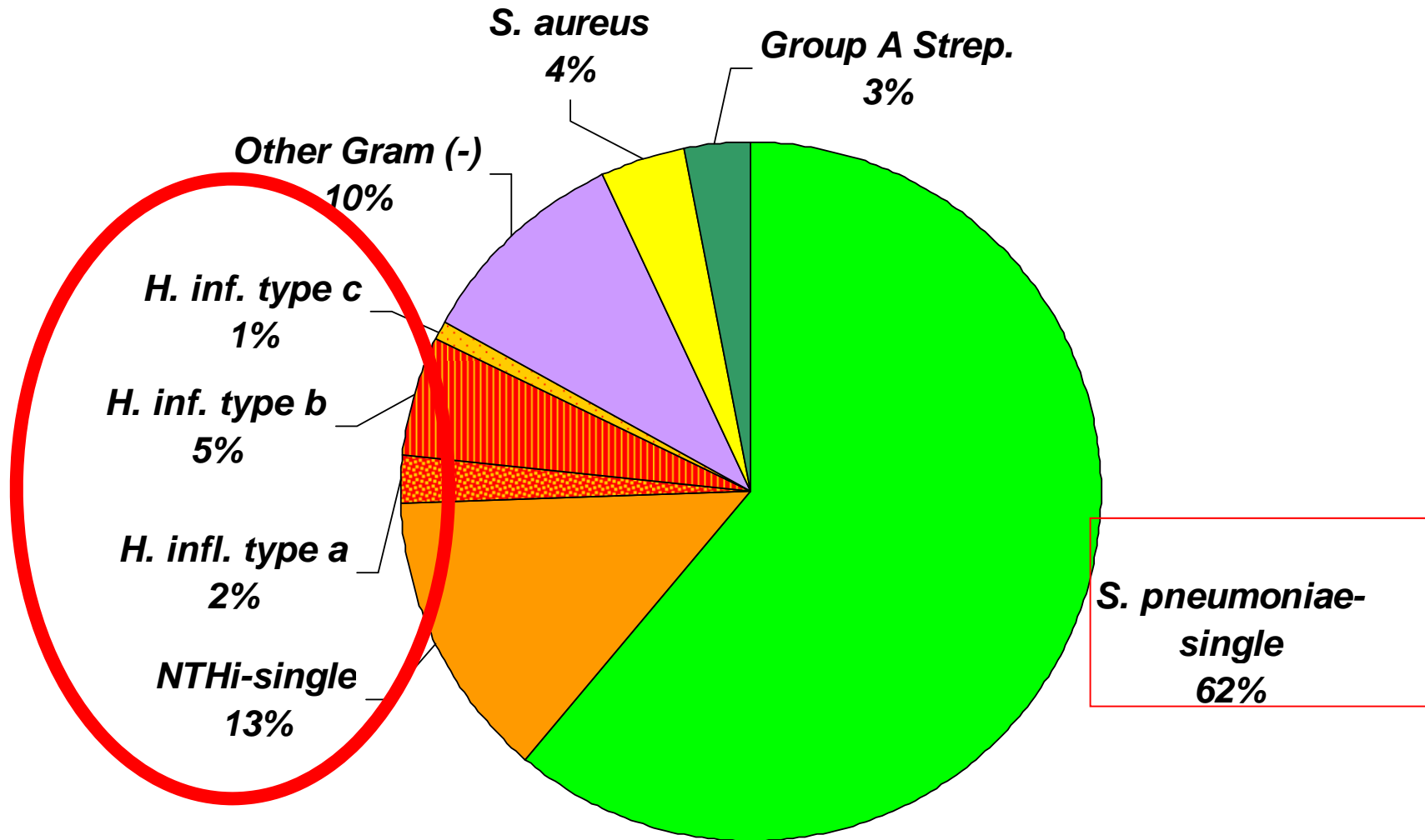
% of Bacteria (N=154)



37 children were ,1 year of age, 71 between 1 and 2 years, 84 between 2 and 5 years and 62 were >5 years of age.

Taina Juven, et al. **Clinical profile of serologically diagnosed pneumococcal pneumonia.** *Pediatr Infect Dis J*, 2001;20:1028–33

Bacteremic CAAP in 129 children in Southern Israel 2001-2008 (n= 6,443 CAAP episodes- 2.0%)



Greenberg D, Dagan R. 2011 PIDU Soroka Medical Center, unpublished data

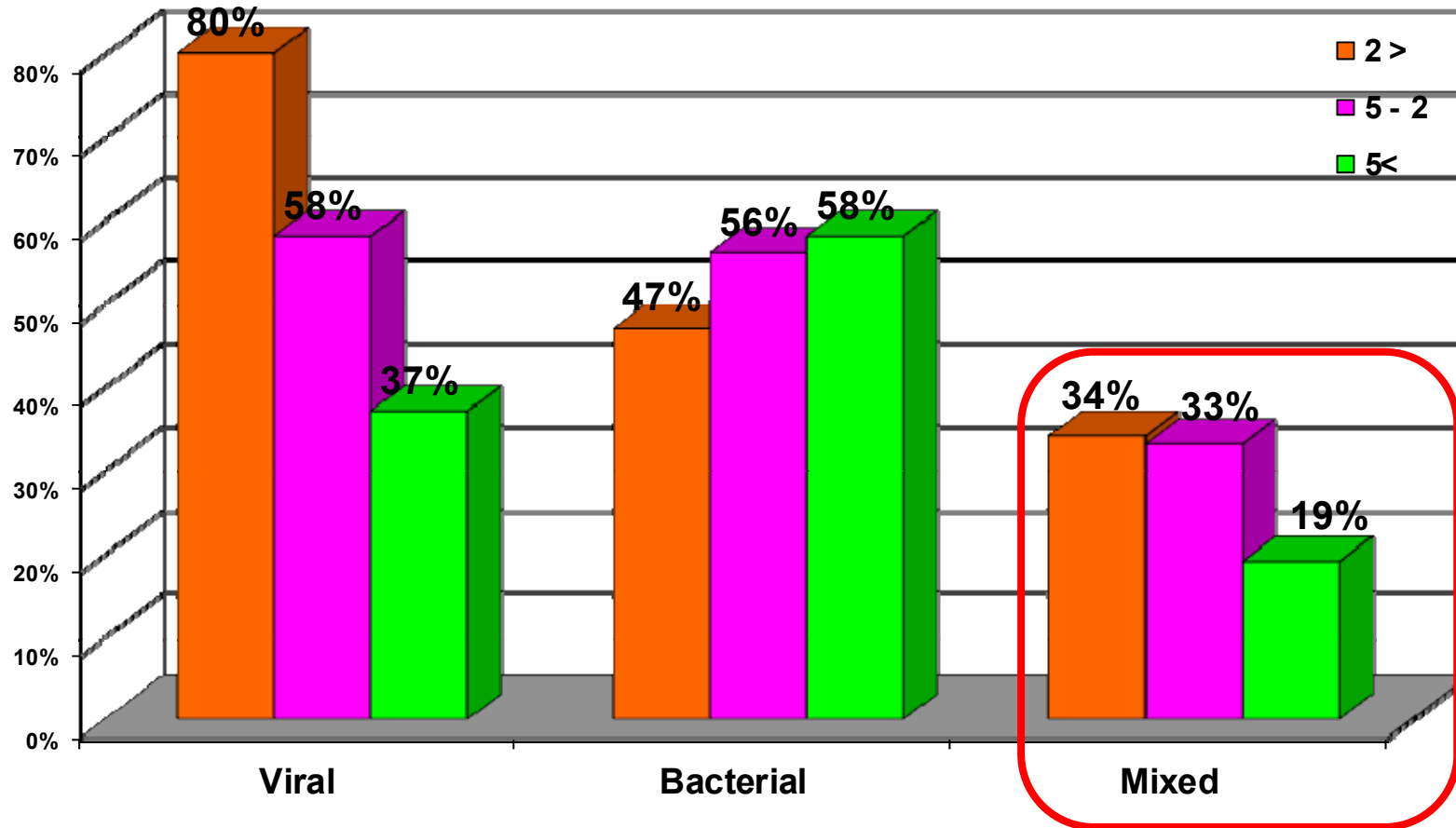
Pathogen	NR-CAP (n = 127)			Rec-CAP (n = 123 ^a)			p ^b
	Mono culture	Coinfection	Total, no. (%) of patients	Mono culture	Coinfection	Total, no. (%) of patients	
Aerobic bacteria	33	14	47 (37.0)	54	27	81 (65.8)	<.001
<i>Haemophilus influenzae</i>	27	6	33 (26.0)	39	24	63 (51.2)	<.001
<i>Moraxella catarrhalis</i>	2	9	11 (8.7)	9	17	26 (21.1)	.009
viruses	30	11	41 (32.3)	30	5	35 (28.5)	NS
Respiratory syncytial virus	8	7	15 (11.8)	6	1	7 (5.7)	NS
Parainfluenzaviruses	5	1	6 (4.7)	8	1	9 (7.3)	NS
Influenzaviruses	5	3	8 (6.3)	2	2	4 (3.3)	NS
Adenovirus	5	1	6 (4.7)	1	3	4 (3.3)	NS
Human metapneumovirus	3	1	4 (3.1)	4	1	5 (4.1)	NS
Picornavirus	2	4	6 (4.7)	1	0	1 (0.8)	NS
Coronaviruses	1	3	4 (3.1)	2	0	2 (1.6)	NS
Cytomegalovirus	1	1	2 (1.6)	2	2	4 (3.3)	NS
Enterovirus (not polio)	0	0	0 (0)	4	1	5 (4.1)	NS
Rhinovirus	0	1	1 (0.8)	0	0	0 (0)	NS
Atypical microorganisms	37			19			.015
<i>Mycoplasma pneumoniae</i>			37/106 tested (34.9)			16/83 tested (19.3)	.03
<i>Chlamydia pneumoniae</i>			0/58 tested (0)			3/54 tested (5.6)	NS

NOTE. NR-CAP, nonresponding community-acquired pneumonia; Rec-CAP, recurrent community-acquired pneumonia; coinfection: cases in which at least 2 infective agents of the same microbiological group were isolated; NS, not significant.

^a n = 122 for viruses.

^b By χ^2 test.

Etiology of Ambulatory Community-acquired Pneumonia

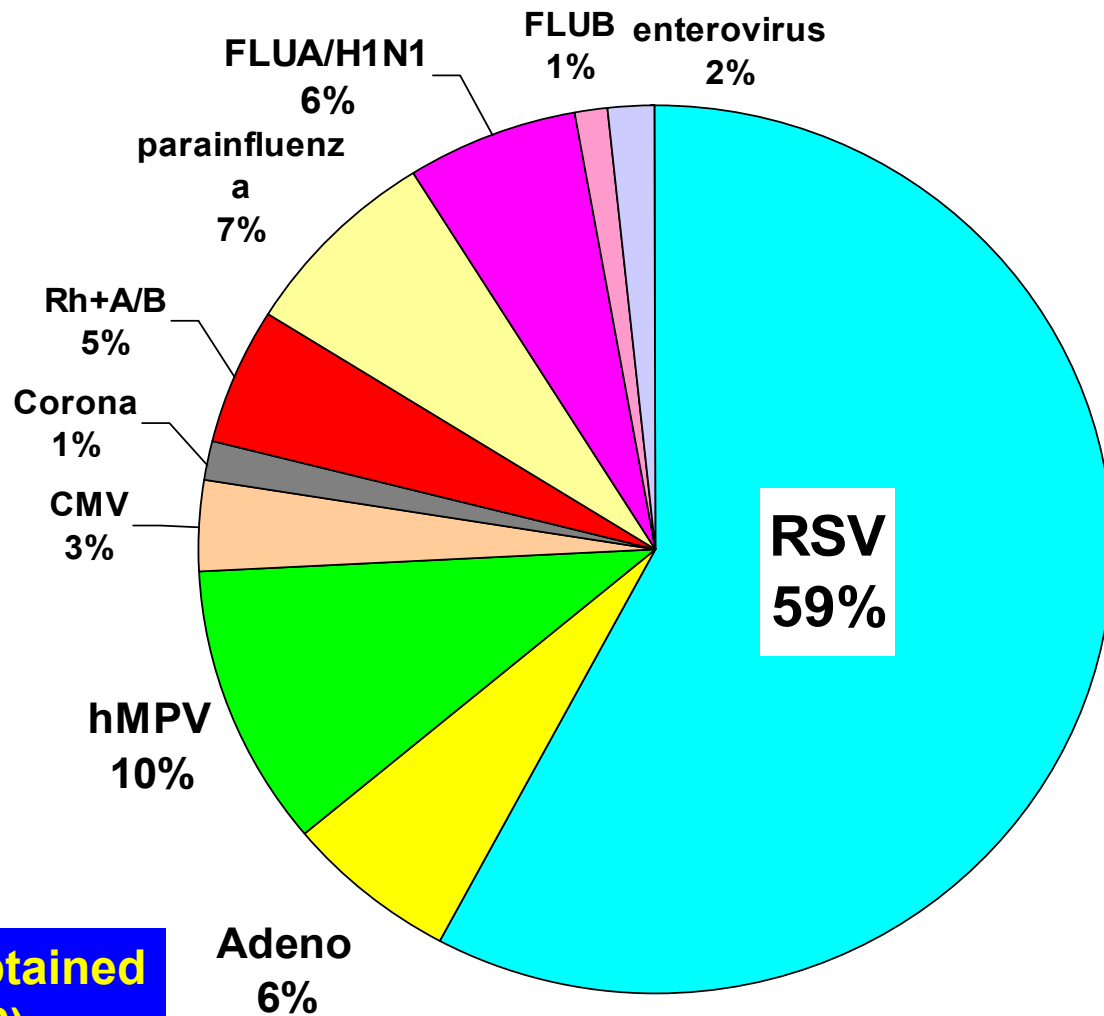


37 children were ,1 year of age, 71 between 1 and 2 years, 84 between 2 and 5 years and 62 were >5 years of age.

Proportion of Mixed Viral-bacterial Infections in the Community-acquired Pneumonia in Children Admitted to a Hospital in North West China

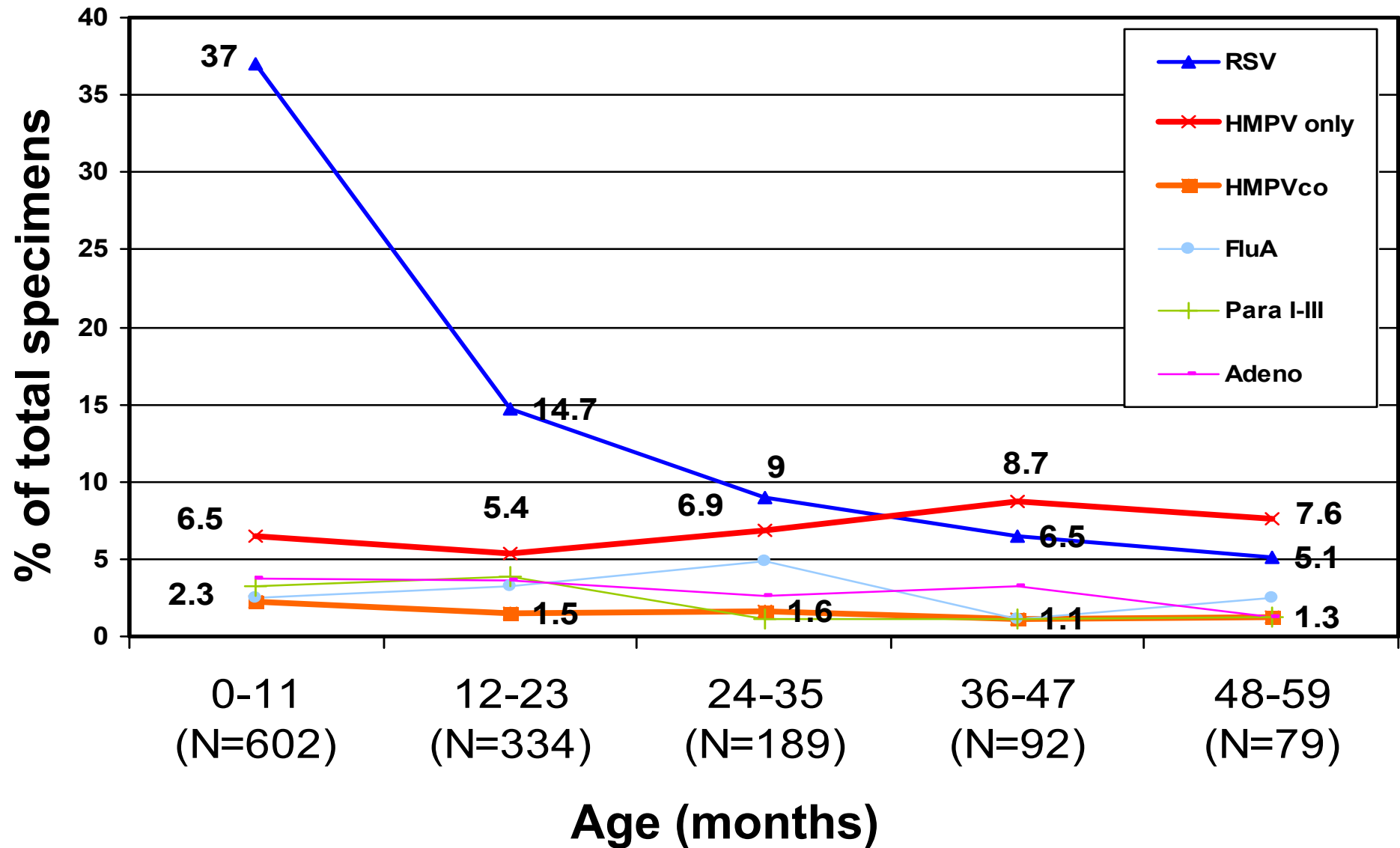
Virus/Bacteria	No. Patients	<i>S. pneumoniae</i>	<i>H. influenzae b</i>	<i>M. catarrhalis</i>	Total
Respiratory syncytial virus	149	25-30%	18 (12%)	0 (0)	55 (37%)
Influenza virus	75	10 (13%)	3 (4%)	2 (3%)	15 (20%)
Adenovirus	67	9 (13%)	6 (9%)	2 (3%)	17 (25%)
Parainfluenza virus	62	10 (16%)	9 (15%)	1 (2%)	20 (32%)
Total	353	66 (19%)	36 (10%)	5 (1%)	107 (13% of 821)

Viral Co-infections in Alveolar Pneumonia Viruses
distribution of all positive NP washes (n=1247) in children <5
years of age with CAAP 11/2001-1/2010



Of all CAPs that NPW were obtained
RSV (+): 31.5% (699/2216)

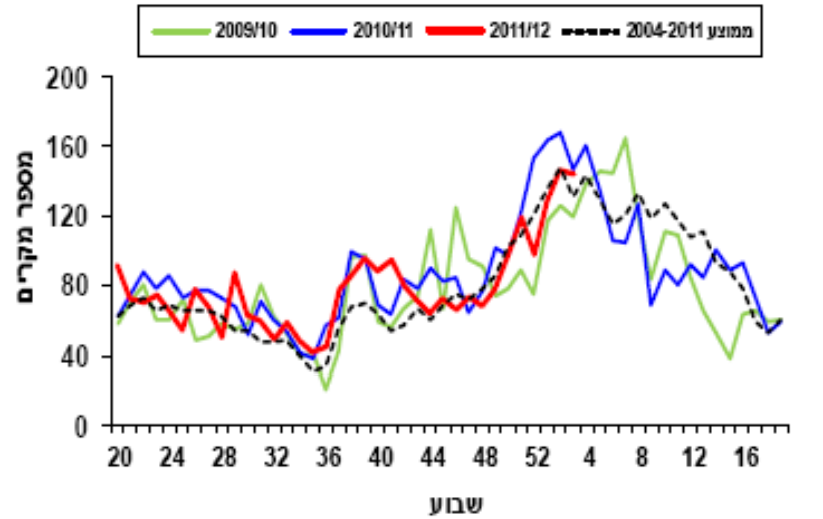
Proportion of viral detection by age in CAP-AP



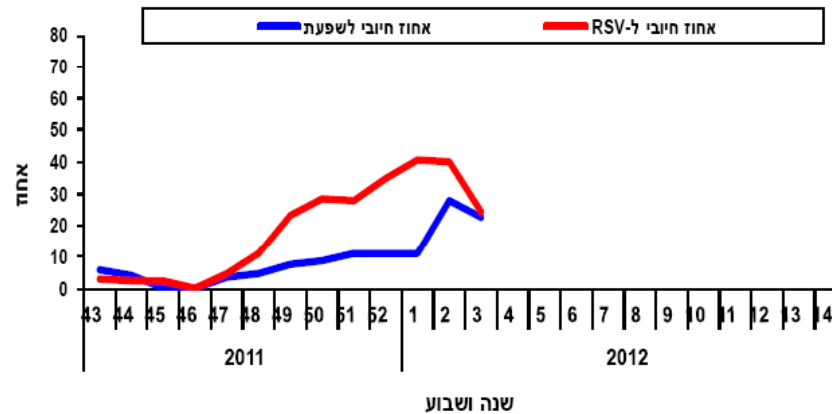


פניות לחדרי מיון (שירותי בריאות כללית)

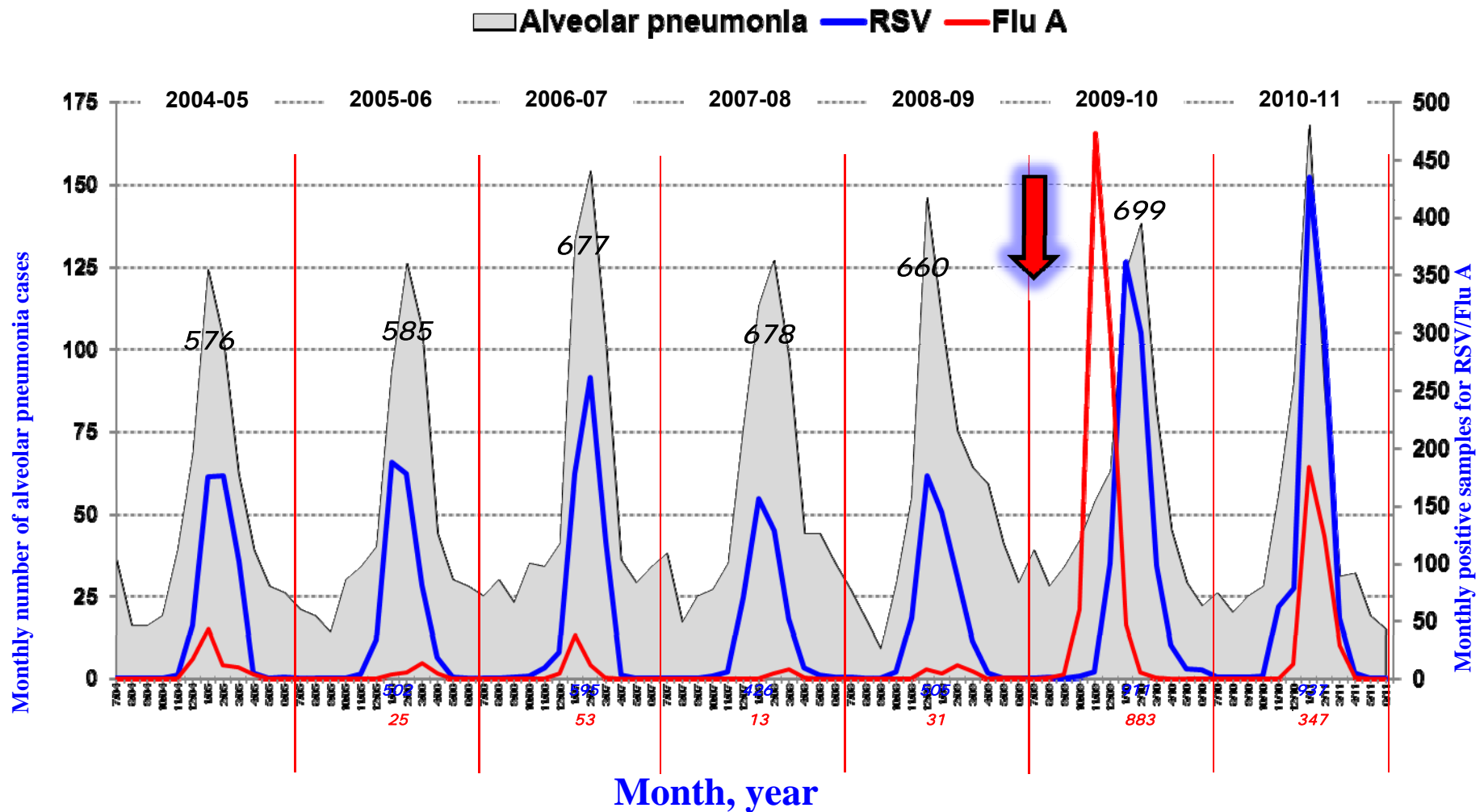
תרשים 7: סך פניות בשבוע למיון ילדים בשל דלקת ריאות, בתי חולים כללית, 2012-2009, בהשוואה לממוצע רב שנתי



תרשים 13: אחוז הדגימות החיוביות לשפעת ל- RSV ברשת הניטור, 2011-12



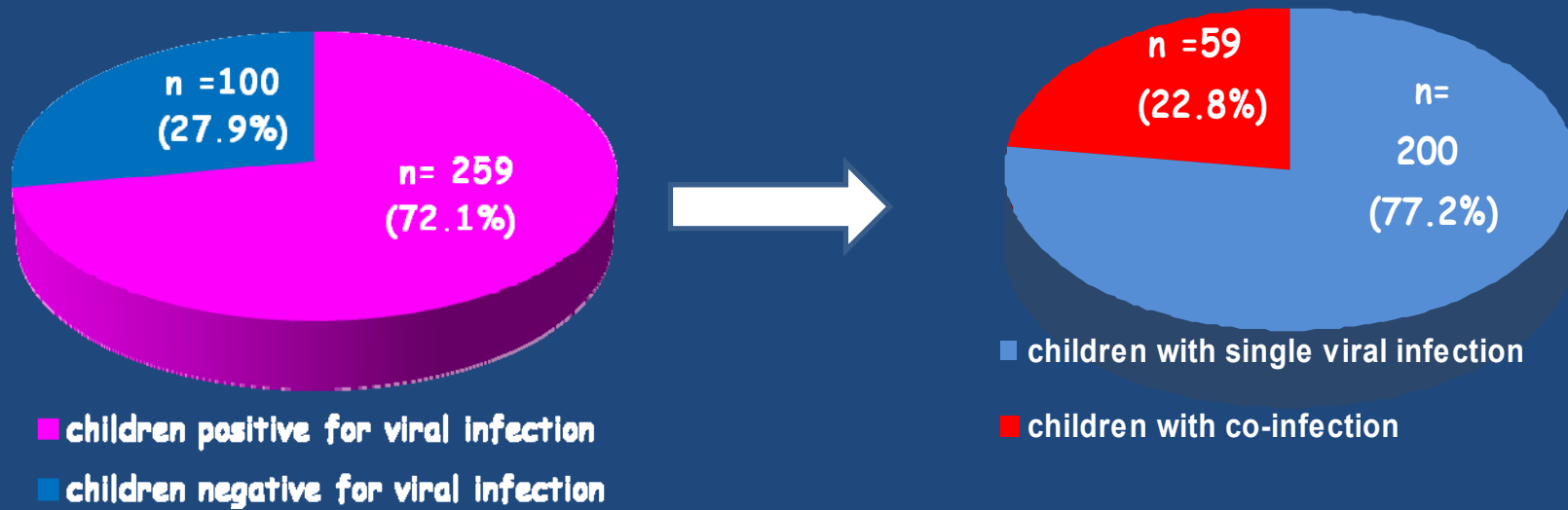
Monthly Hospital Visits for Alveolar Pneumonia in Children <2 Years, Southern Israel, Since Jan 2002



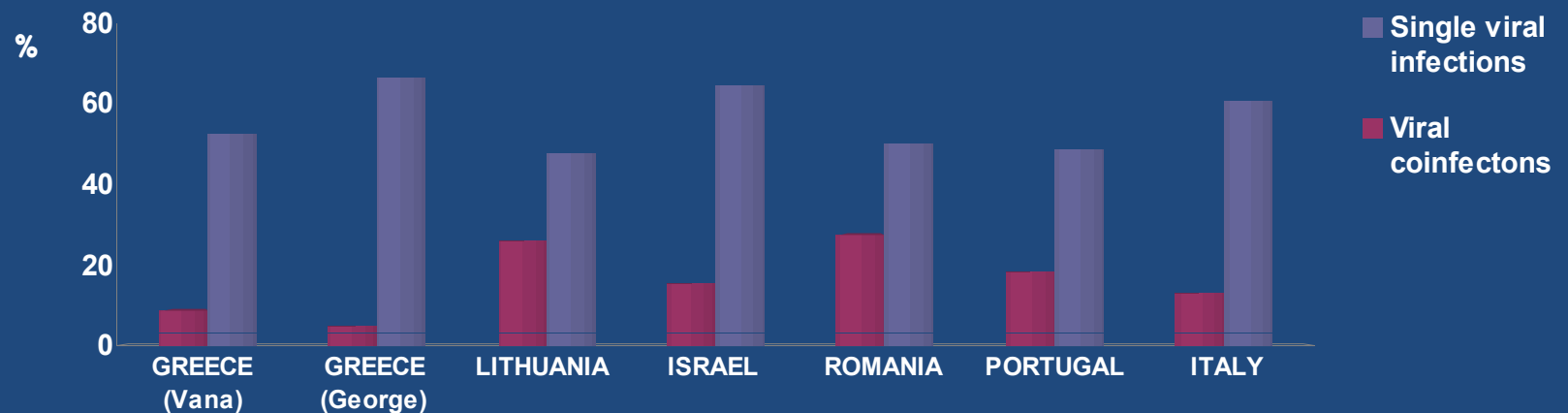
PIDU Soroka Medical Center 2011. A prospective population-based study to document hospital use for alveolar pneumonia in Young children

Episodes of Rx-confirmed CAP with viruses

CAP-PRI STUDY (Esposito S et al., 2011 unpublished data)

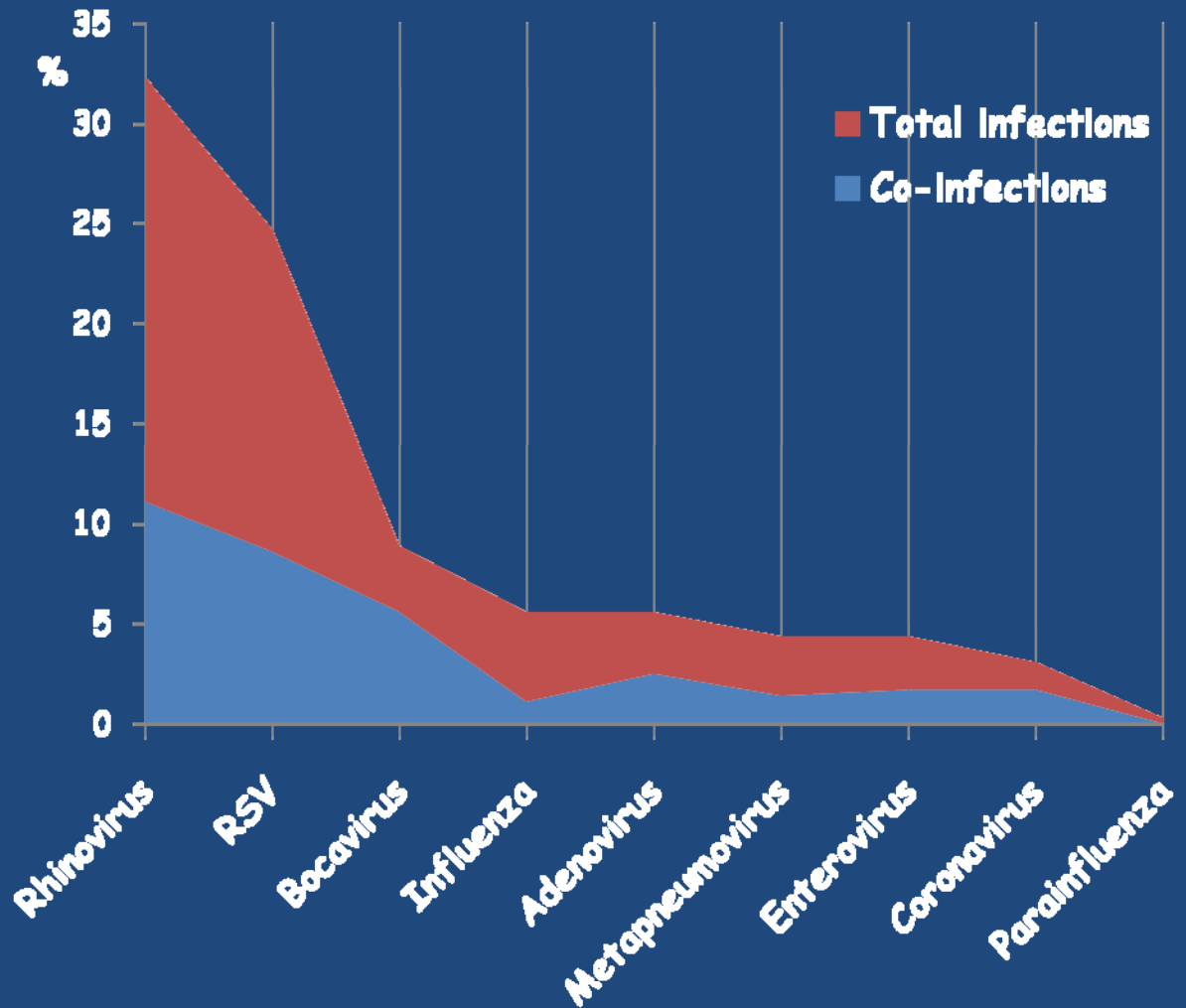


Frequency of viral infections and coinfections in CAP-PRI countries (% vs total CAP episodes for each country)



Frequency of viral infections and coinfections in children with CAP according to virus

Viral type	Total No. (%)	Co-infect. No. (%)
RSV	89 (24.8)	31 (34.8)
Rhinovirus	116 (32.3)	40 (34.5)
A	55(15.3)	17(30.9)
B	10 (2.8)	4 (40.0)
C	40(11.1)	13(32.5)
undet	11 (3.1)	6 (54.5)
Bocavirus	32 (8.9)	20 (62.5)
Influenza viruses	20 (5.6)	4 (20)
A/H1N1s	0	0
A/H3N2	2 (0.6)	0
B	3 (0.8)	1 (33.3)
A/H1N1v	15 (4.2)	3 (20)
hMPV	16 (4.4)	5 (31.3)
Coronavirus	11 (3.1)	6 (54.5)
OC43	4 (1.1)	1 (25)
229E	0	0
NL63	5 (1.4)	3 (60.0)
HKU1	2(0.6)	2(100)
Adenovirus	20 (5.6)	9(45.0)
Enterovirus	16 (4.4)	6 (37.5)
Parainfluenza	1 (0.3)	0
1	0	0
2	0	0
3	1 (0.3)	0
4	0	0



Viral and bacterial The co-infection paradigm

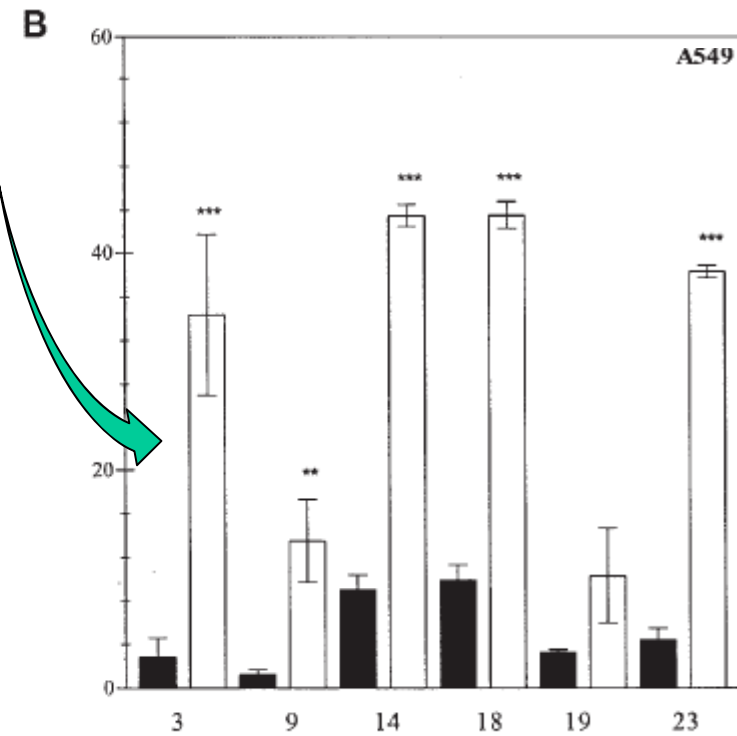
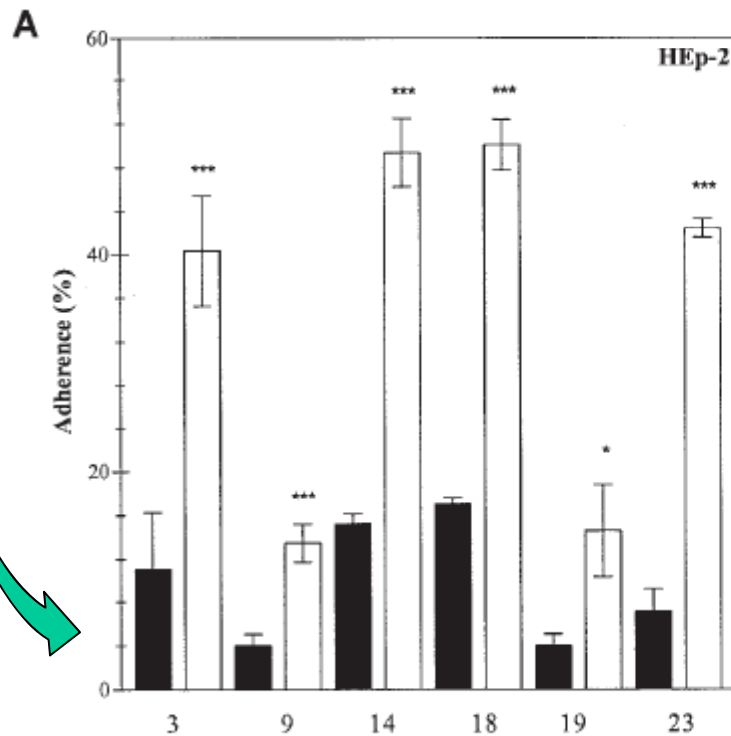


Enhanced Adherence of *S. pneumoniae* to Human Epithelial Cells Infected with Respiratory Syncytial Virus

human nasopharyngeal cells (HEp-2) and pneumocyte type II cells (A549)

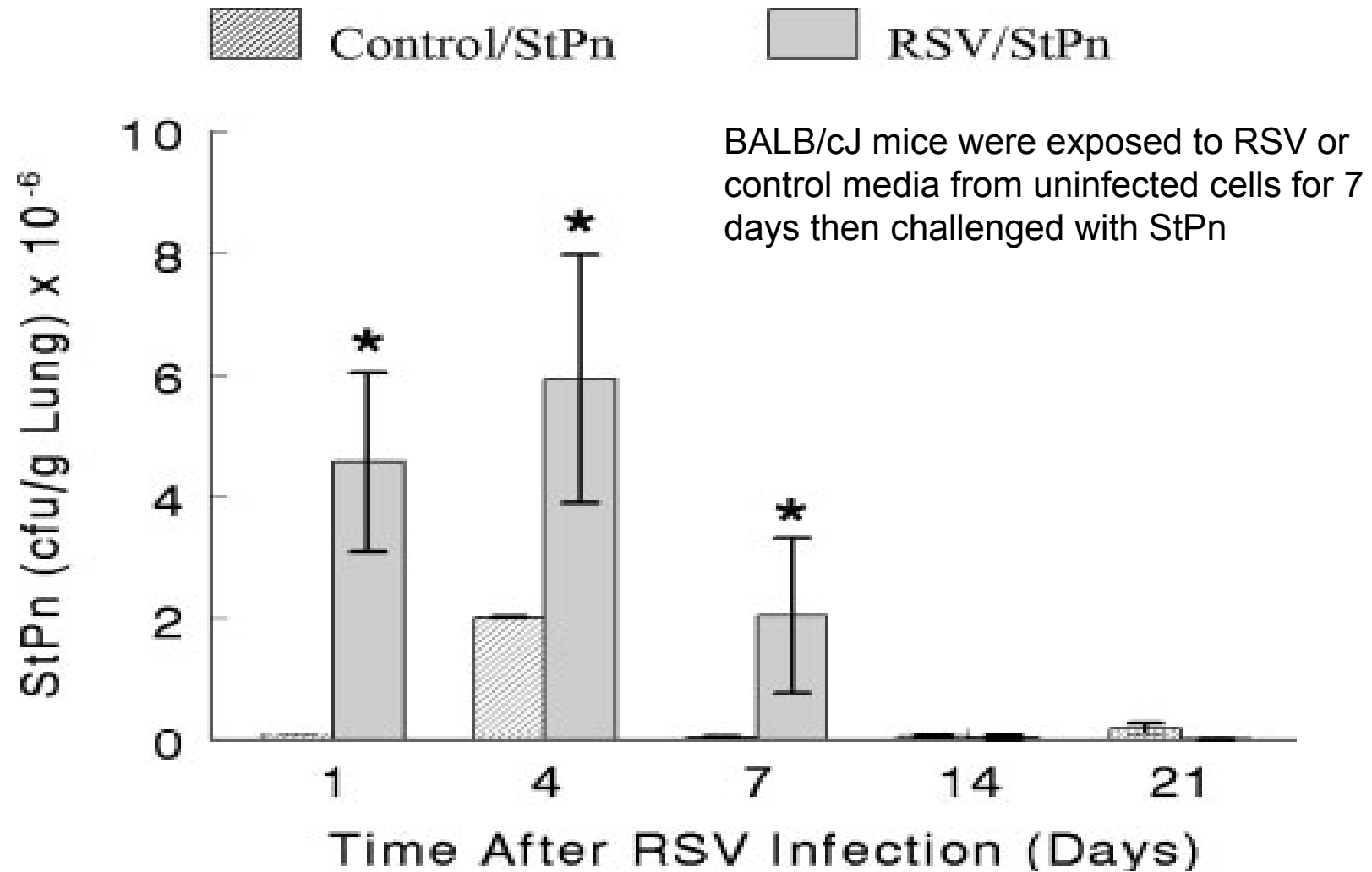
Filled bars: percentage of pneumococcal adherence to uninfected A549 monolayers;

Open bars: percentage of maximal enhanced pneumococcal adherence to RSV-infected A549 cells



S. pneumoniae serotypes

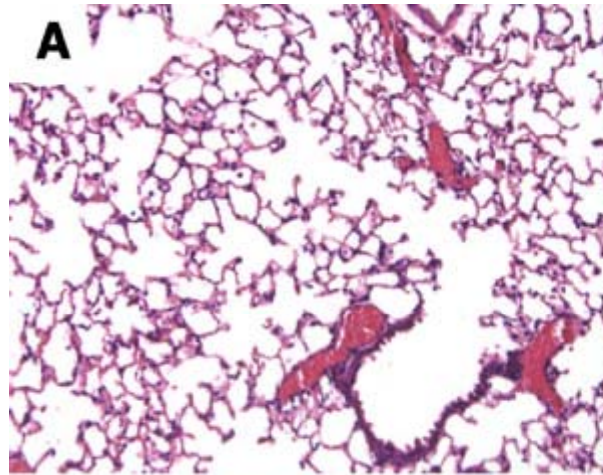
Effect of RSV infection on clearance of *S. pneumoniae* (StPn) To determine the duration of the effect of RSV infection on StPn clearance from the lung



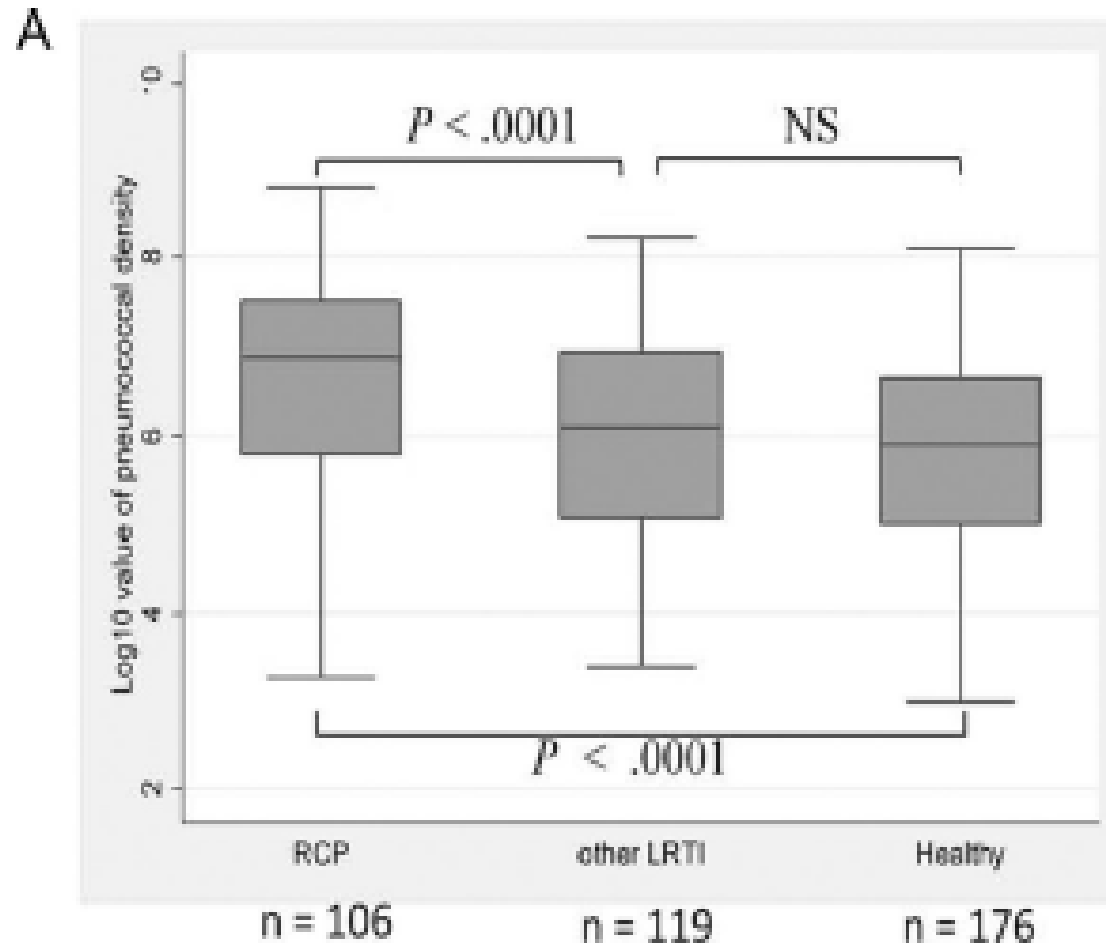
Note that StPn clearance was decreased by 1 day following primary RSV exposure and that this effect on StPn clearance persisted at least 7 days. Data presented are representative of two separate experiments, 10 mice/group per time point. P<0.01

Histopathology of RSV- *S. pneumoniae* sequential infection

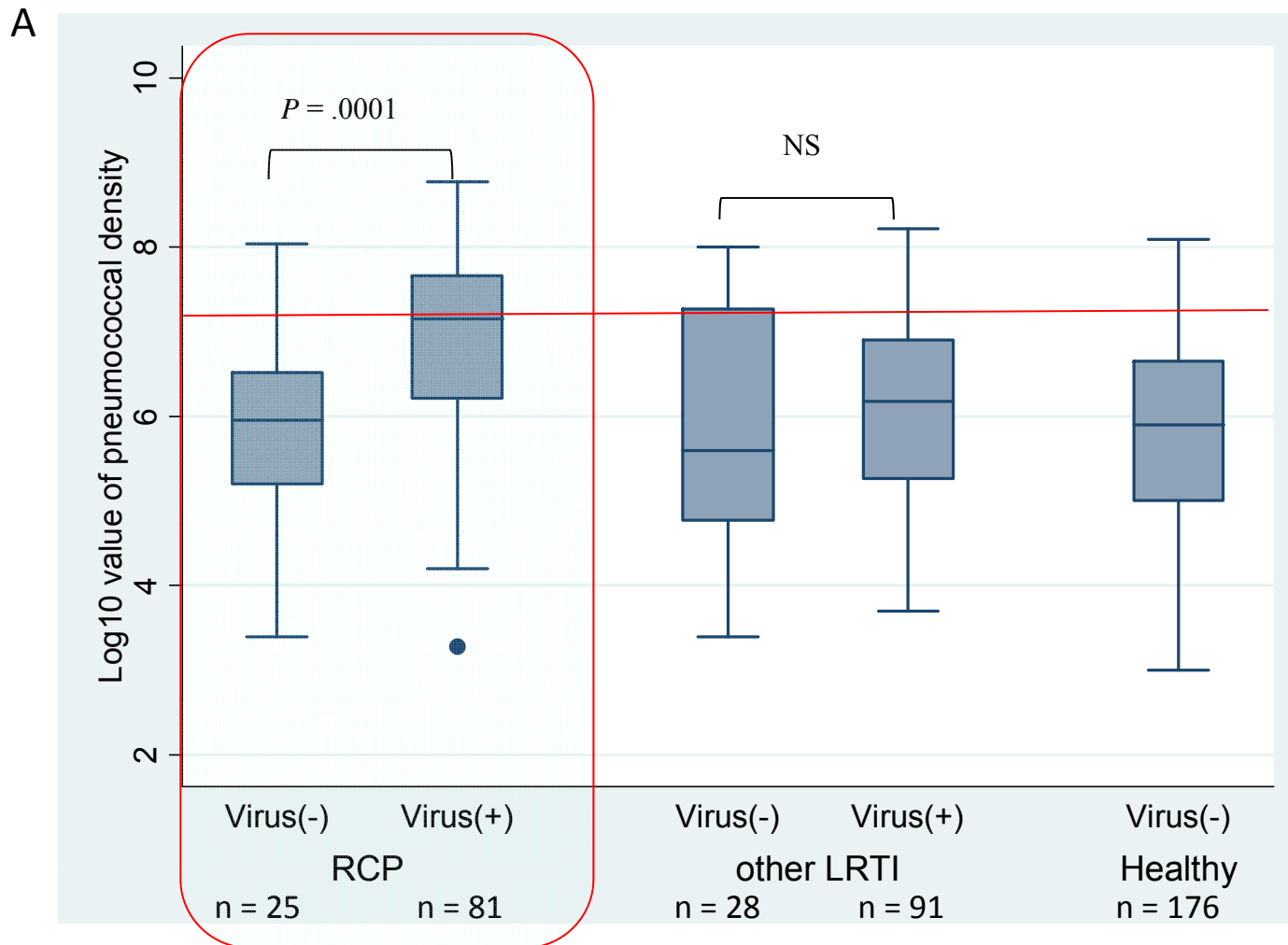
Control-PBS



Nasopharyngeal bacterial loads of *S. pneumoniae* among radiographic pneumonia, LRTI and health, children



The association between an increased pneumococcal load in nasopharynx of radiologically confirmed pneumonia children and viral co-infection





RSV AND SERIOUS BACTERIAL INFECTIONS We recently treated an infant who had RSV bronchiolitis and subsequently developed pneumococcal meningitis. The pediatric residents managing the child asked whether RSV is commonly followed by serious bacterial infections (SBI). The answer is no; it is very uncommon for SBI to follow RSV disease. As an example, Levine and associates (**Pediatrics**

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Canada: Duroral. It contains RU564 VI v. cholera Inaba and Ogawa serotypes and El Tor and Classical biotypes and a recombinant non-toxic B-subunit providing added protection against ETEC traveler's diarrhea. Efficacy against severe ETEC diarrhea (86% with a wide CI) and cholera (85% with a wide CI) is pretty good considering

Occult Serious Bacterial Infection in Infants Younger Than 60 to 90 Days With Bronchiolitis

A Systematic Review

Shawn Ralston, MD; Vanessa Hill, MD; Ami Waters, MD

Objective

to determine the prevalence of occult serious bacterial infection in febrile infants younger than 60 to 90 days with bronchiolitis or respiratory syncytial virus infection.

Data Sources

Medline and other databases were searched for studies of bacterial infection in febrile infants younger than 60 to 90 days with clinical bronchiolitis and/or respiratory syncytial virus infection.

Study Selection: Studies reporting on cultures performed at the time of presentation to care and providing a denominator, ie, total number of each type of culture obtained, were analyzed.

Main Exposure: Admission for bronchiolitis.

A screening approach to culturing for serious bacterial infections in febrile infants presenting with bronchiolitis or respiratory syncytial virus infection is very low yield.

Statistics for meningitis and bacteremia are not provided because of an excess of zero events in these samples.

Conclusions: A screening approach to culturing for serious bacterial infections in febrile infants presenting with bronchiolitis or respiratory syncytial virus infection is very low yield. The rate of urine cultures positive for bacteria remains significant, though asymptomatic bacteriuria may confound these results.

Arch Pediatr Adolesc Med. 2011;165(10):951-956

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A 1 months old newborn was admitted to the Soroka University Medical Center March-2011 due to fever and respiratory distress. WBC- 10K and CRP 5.2

רשימת	אנטיביוטיקה	התדירות
[...]	Penicillin	q6h p.o.
[...]	Ceftriaxone	q12h p.o.
[...]	Clindamycin	q6h p.o.
[...]	Clindamycinol	q6h p.o.
[...]	Erythromycin	q6h p.o.
[...]	Tetracycline	q6h p.o.
[...]	Cotrimoxazole	q6h p.o.
[...]	Vancomycin	q6h p.o.
[...]	Ertapenem	q6h p.o.
[...]	Levofloxacin	q6h p.o.



מקור הנתונים: אישולאב

תאריך איסוף: 02/03/2011 12:04

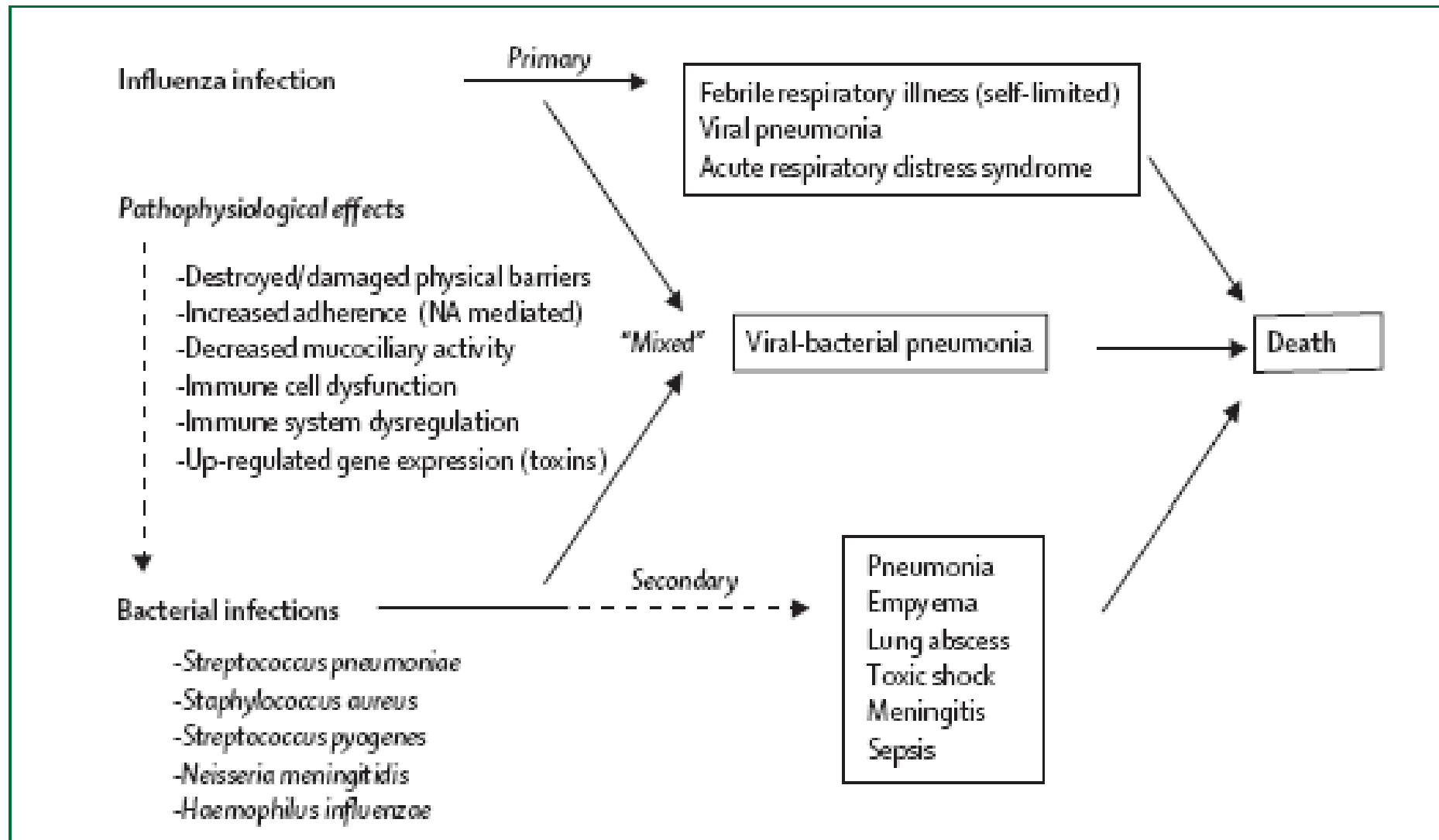
מדבקה: 51022642

הערות למדבקה: מקור דגימה: משטח אף

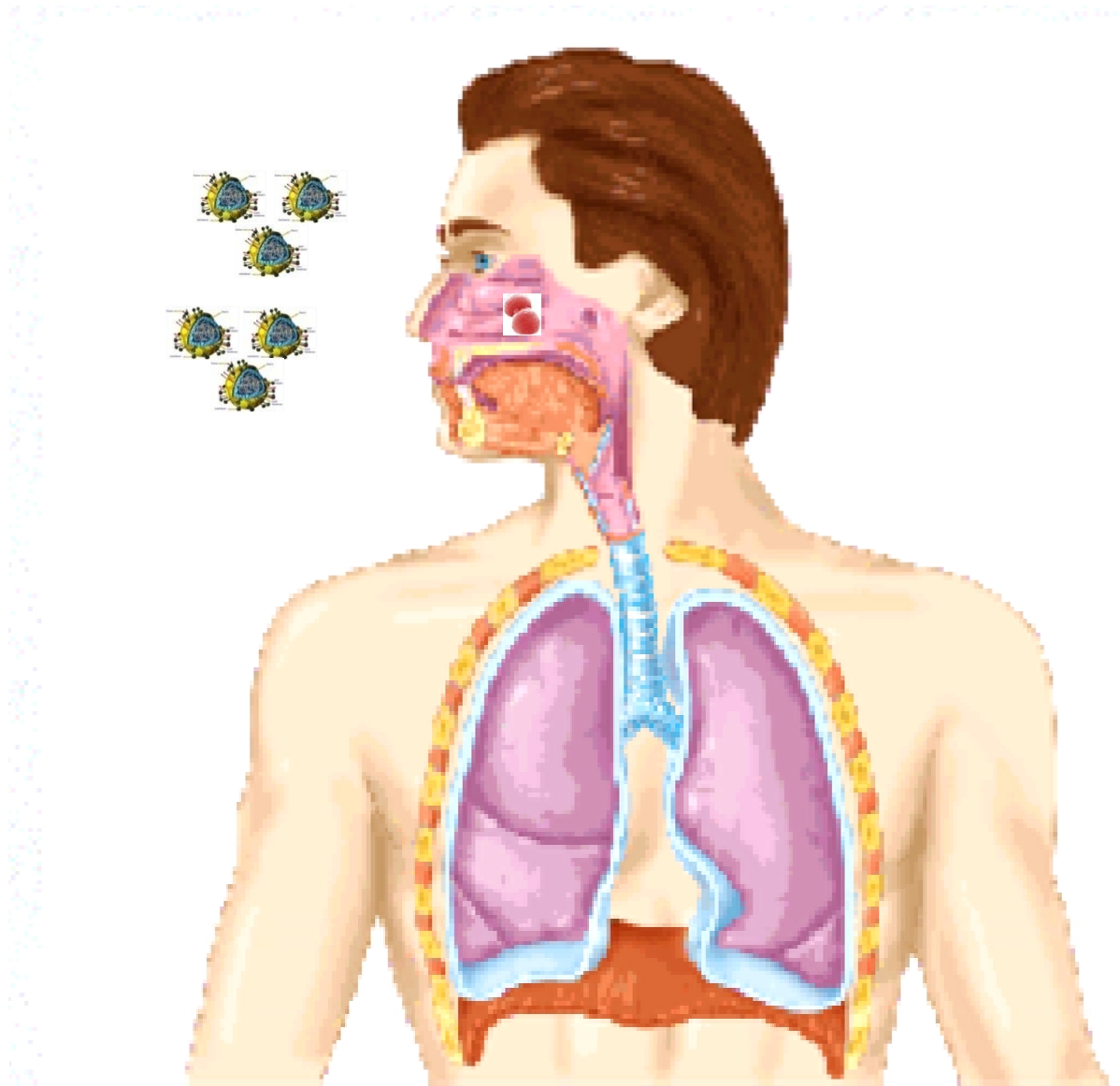
שם המיקרו	המצא			
hMETAPNEUMOVIRUS-PCR	שלילי			
RSV RT-PCR	חיובי			
INFLUENZA A RT-PCR	שלילי			
INFLUENZA A H1N1 PCR	שלילי			
INFLUENZA B RT-PCR	שלילי			
ADENOVIRUS Ag-IF	שלילי			
NFLUENZA A Ag-IF	שלילי			
NFLUENZA B Ag-IF	שלילי			
PARAINFLUENZA 1-IF	שלילי			
PARAINFLUENZA 2-IF	שלילי			
PARAINFLUENZA 3-IF	שלילי			
hMETAPNEUMOVIRUS-IF	שלילי			
RESP. SYNCYVIRUS-IF	חיובי			

RSV- Positive

Examples of pathophysiological interactions between influenza and bacterial respiratory pathogens and various clinical expressions



It is accepted that the pathogenesis of CAAP is micro aspiration of bacteria spreading from the nasopharynx to the lung

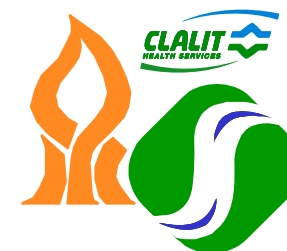


The Relative burden of Respiratory
Syncytial Virus-associated community-
acquired alveolar pneumonia in children
born premature at 30-35 weeks
gestational age

Relative burden of respiratory syncytial virus associated community-acquired pneumonia (RSV-CAAP) in children born 30-35 weeks gestational age

D. Greenberg, N. Givon-Lavi, E. Shany, J. Bar Ziv, R. Dagan.

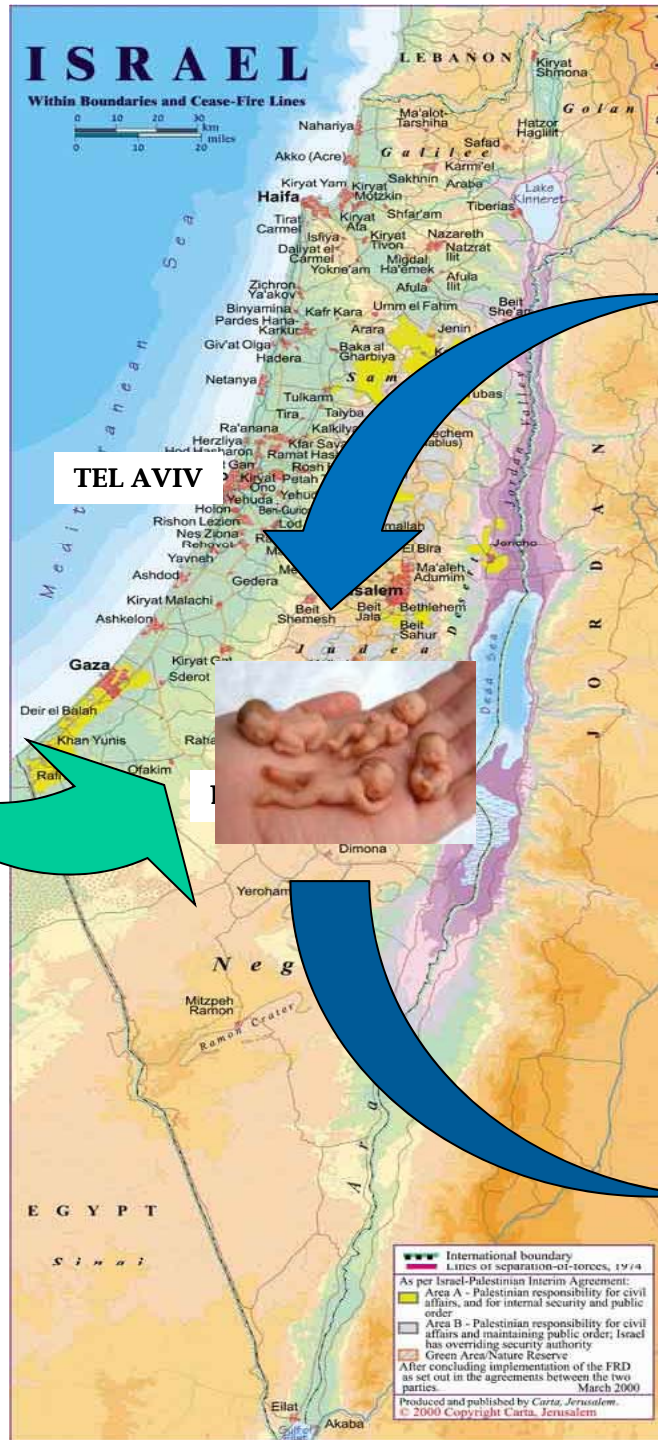
The Pediatric Infectious Disease Unit
Neonatal Intensive Care Unit
Soroka University Medical Center and The Faculty
of Health Sciences, Ben-Gurion University of the
Negev, Beer-Sheva, Israel
Department of Radiology, Hadassah University
Medical Center, Jerusalem



Objective of the Study

- To compare hospitalization and PICU admission rates for RSV-associated CAAP (RSV-CAAP) in children born at 30-35w GA (30-35wGA) *vs.* those born at term (≥ 36 w GA).

Soroka University Medical Center



World Health Organization
Pneumonia Vaccine Trial
Investigators's Group.
Standardization of interpretation
of chestradiographs for the
diagnosis of pneumonia in
children. WHO/V&B/01.35:
World Health Organization,
Geneva, 2001.

WHO/V&B/01.35
ORIGINAL: ENGLISH
DISTR.: GENERAL

Standardization of interpretation of chest radiographs for the diagnosis of pneumonia in children

World Health Organization Pneumonia
Vaccine Trial Investigators' Group

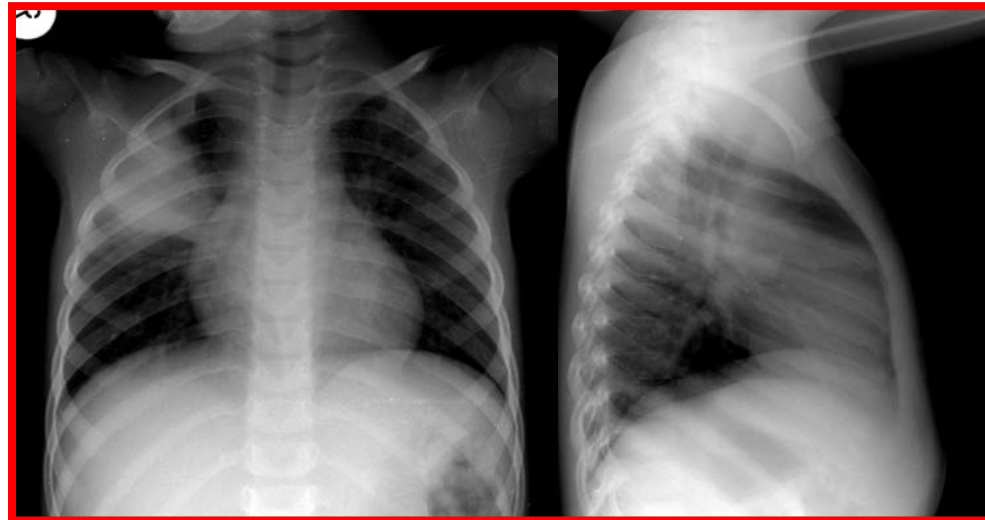
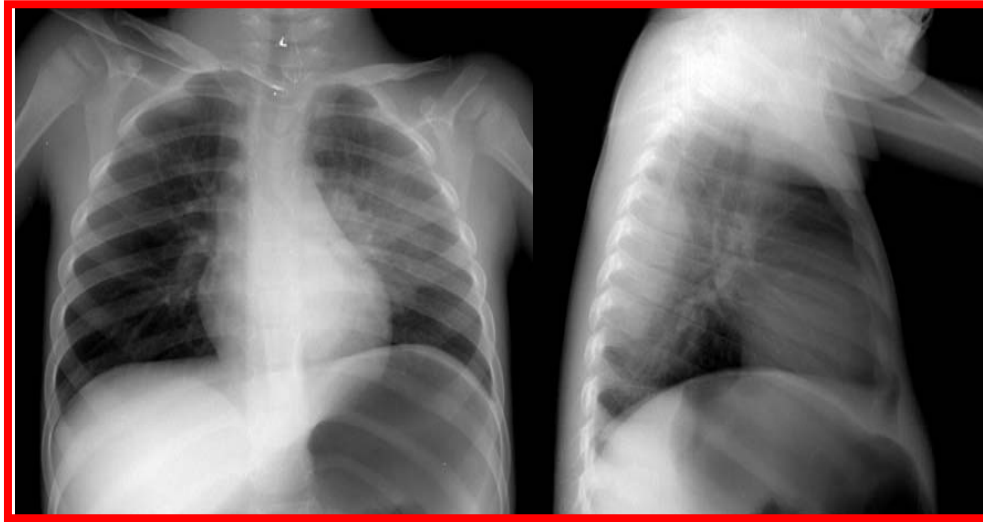


**DEPARTMENT OF VACCINES
AND BIOLOGICALS**

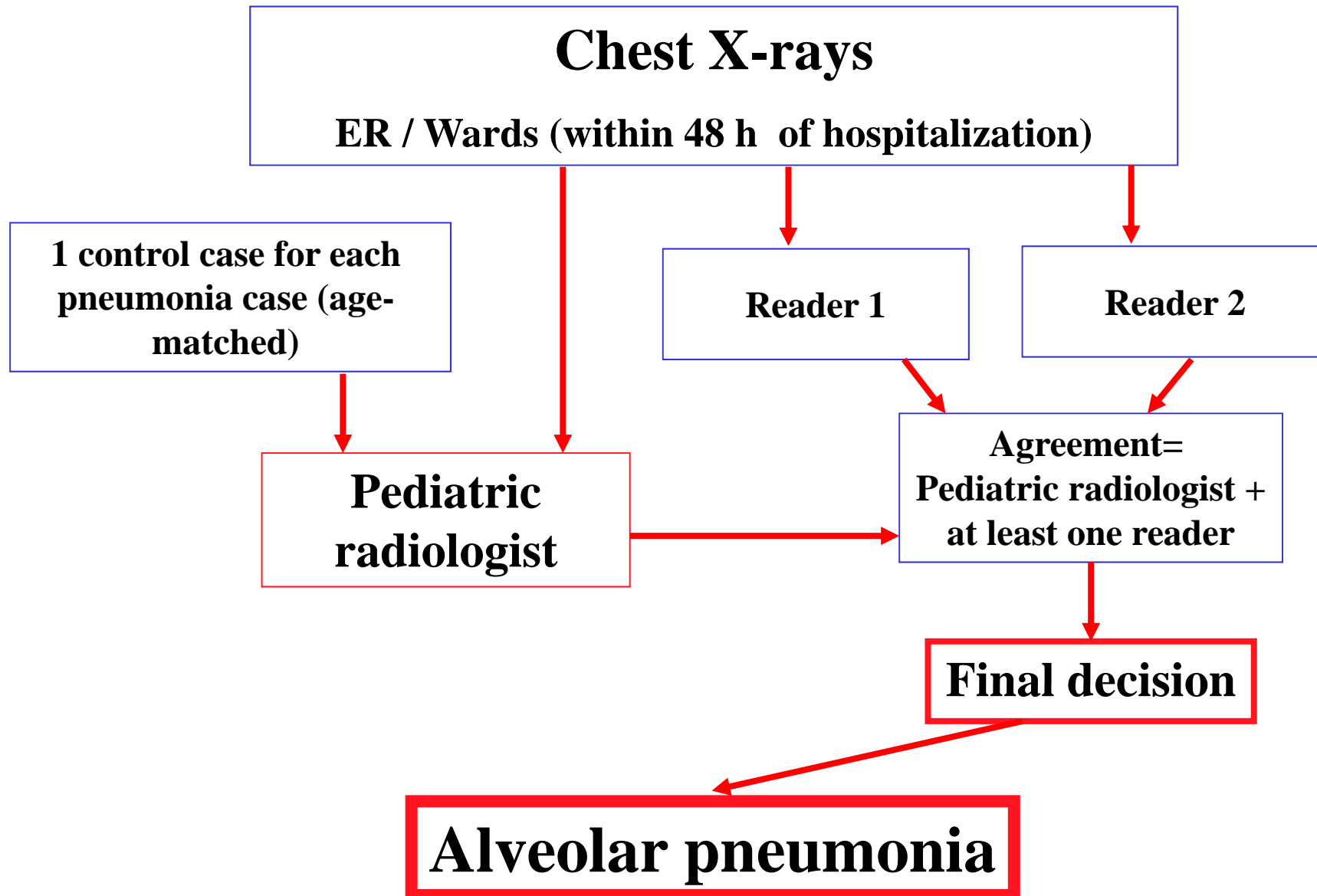


World Health Organization
Geneva
2001

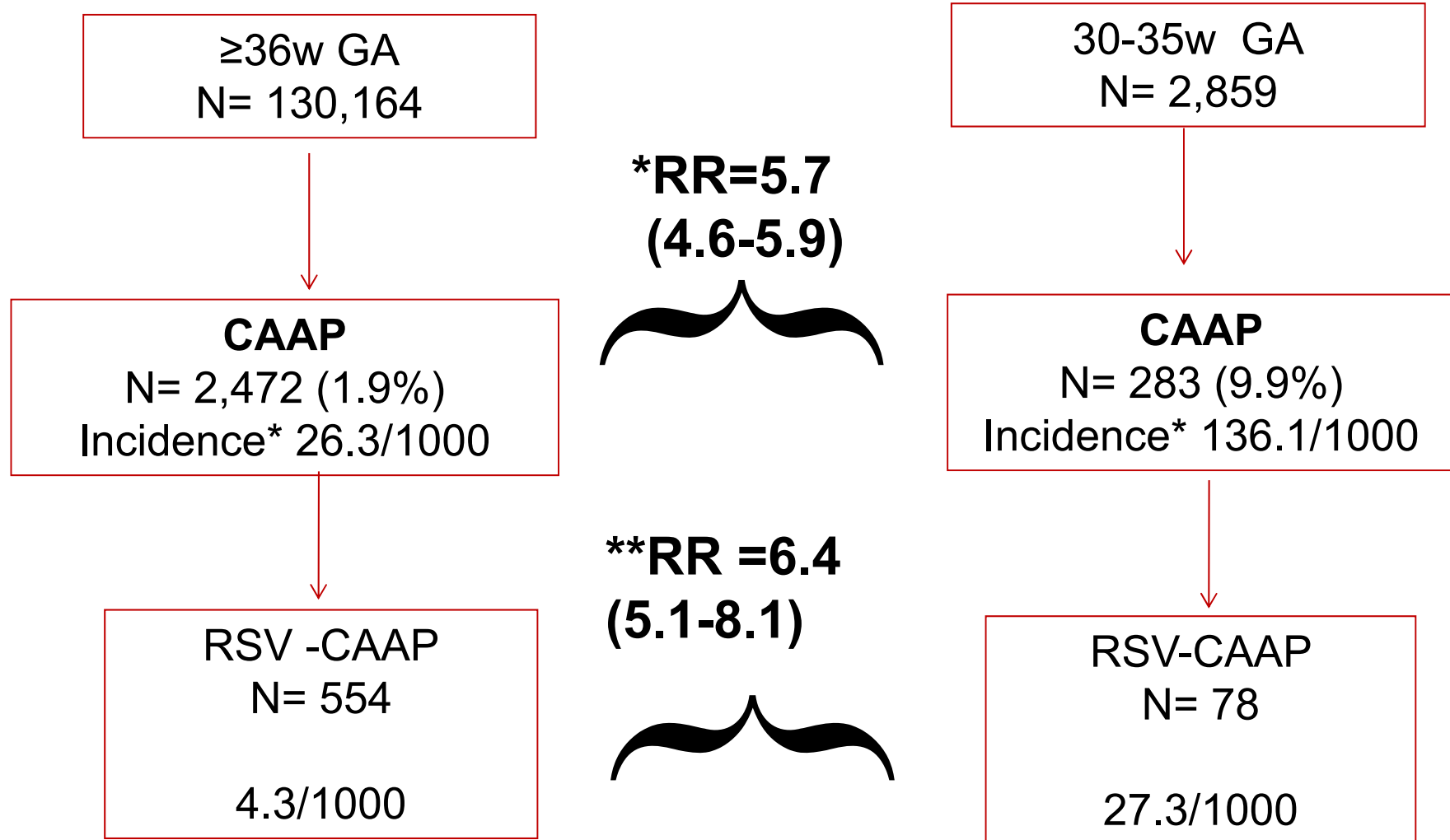
Alveolar (AL)



Evaluation of chest radiographs in children younger than 5 years admitted to the pediatric emergency room



Comparison of **hospitalization** rates in children <5 years with CAAP with and without RSV, born 30-35 *vs.* ≥ 36 weeks gestational age during the RSV season (November – March 2001-2010)



*Relative risk (RR) of CAAP in patients born 30-35 weeks GA vs. ≥ 36 weeks GA,

**Relative risk (RR) of RSV-CAAP in patients born 30-35 weeks GA vs. ≥ 36 weeks GA,

*Extrapolated from children from whom RSV was obtained

RR were controlled for age and ethnic groups

Figure 2: Comparison of hospitalization rates **in PICU** in children <5 years with CAAP with and without RSV, born 30- 35 *vs.* ≥ 36 w gestational age during the RSV season (November – March)

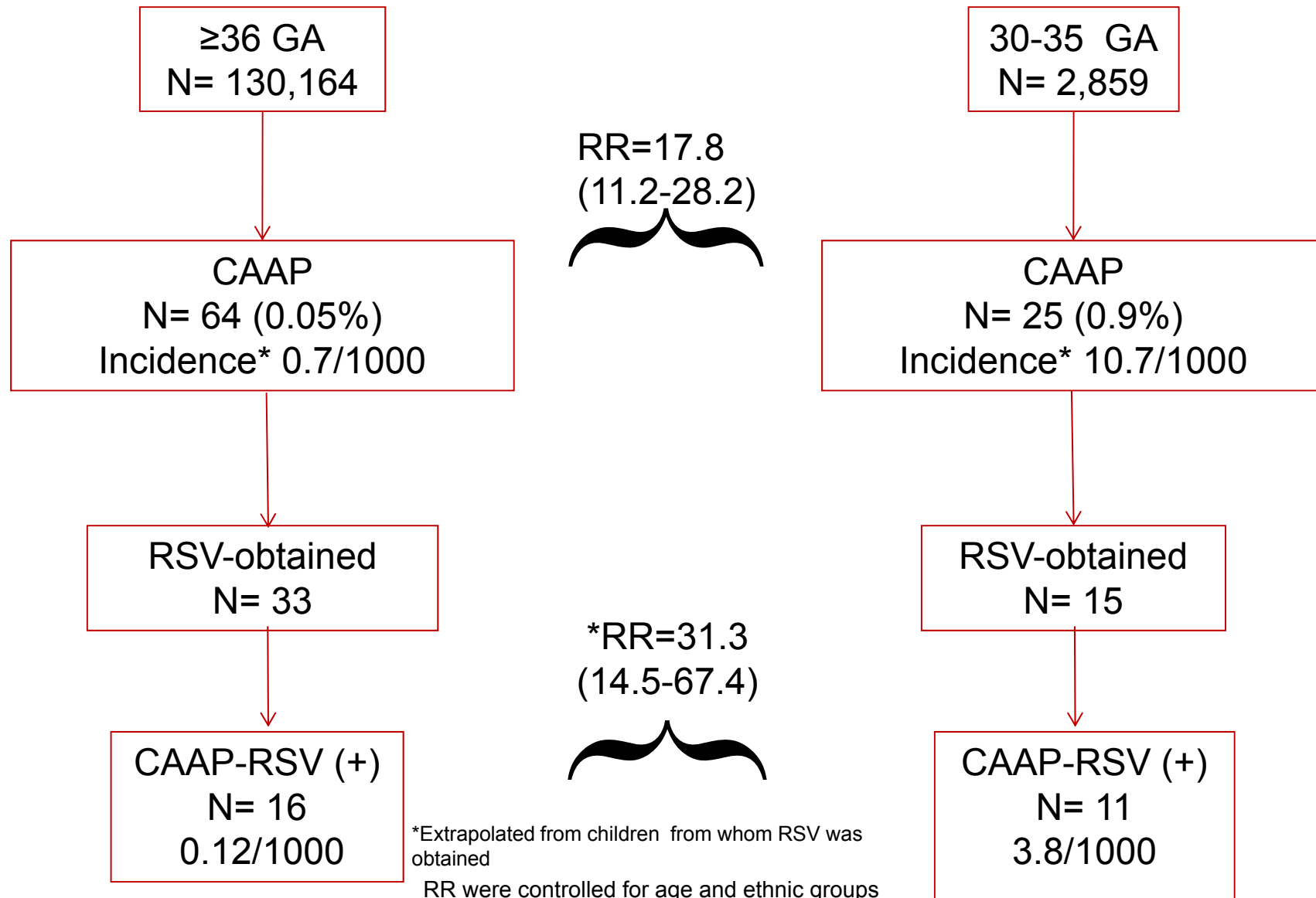


Figure 1: Comparison of **hospitalization** rates in children <5 years with CAAP with and without RSV, born 30-31, 32, 33-35 *vs.* ≥ 36 w GA during the RSV season (November – March)

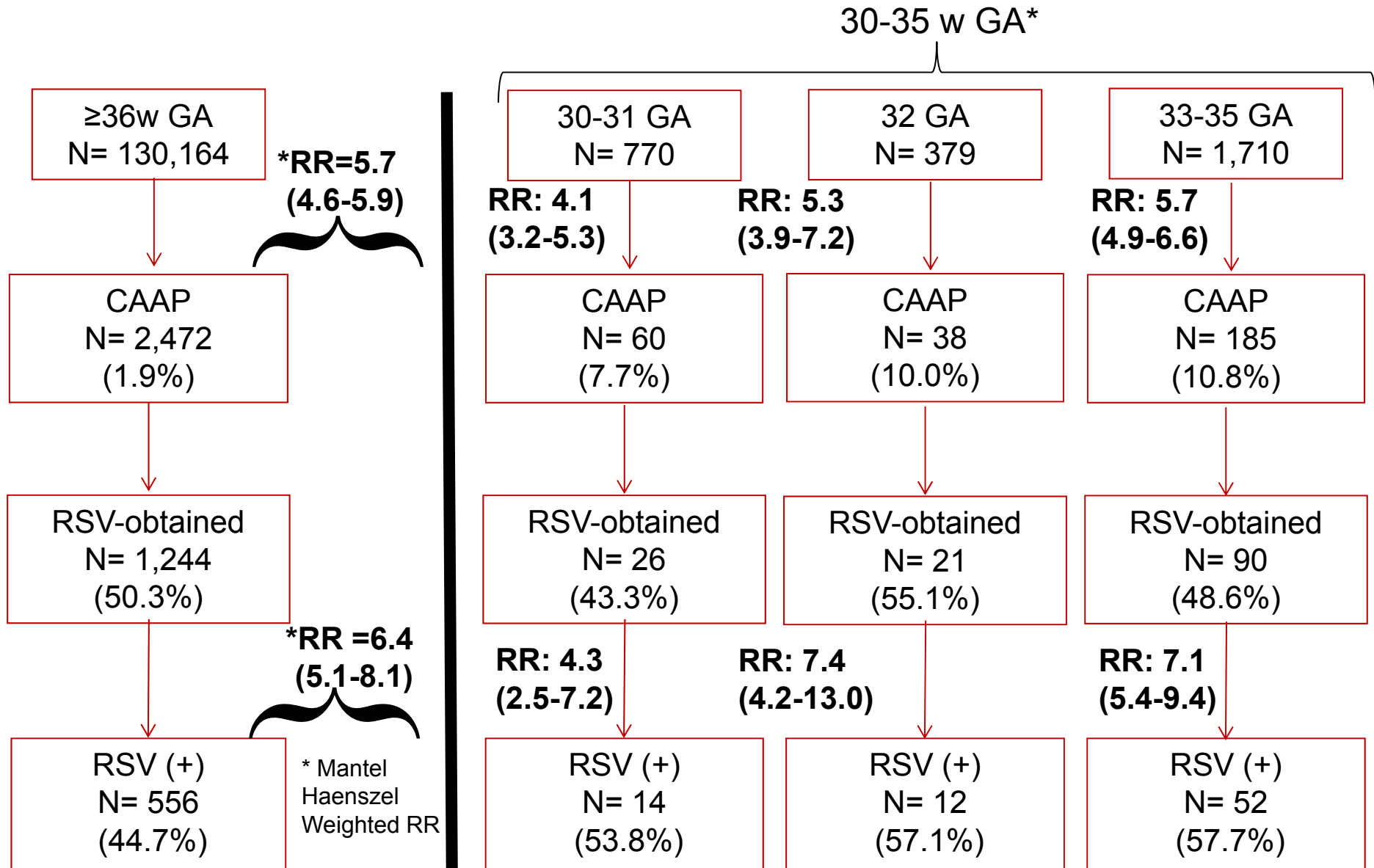
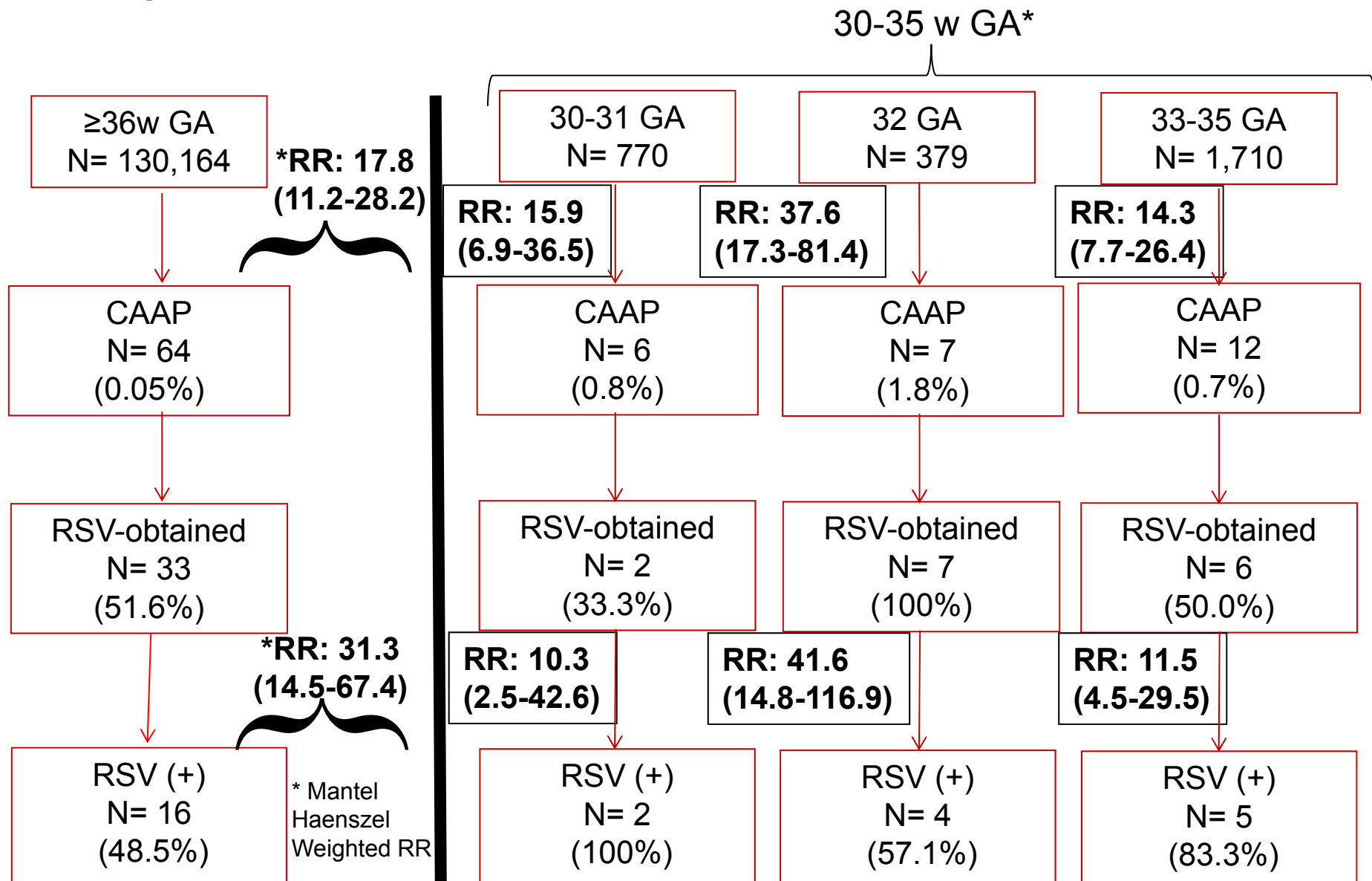
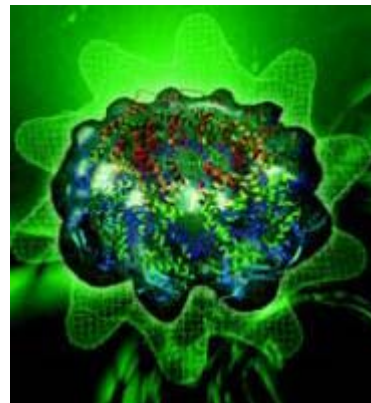
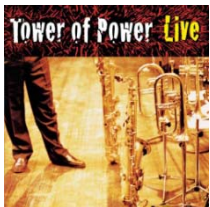
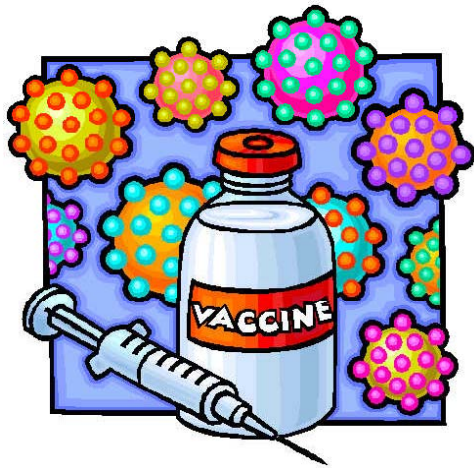


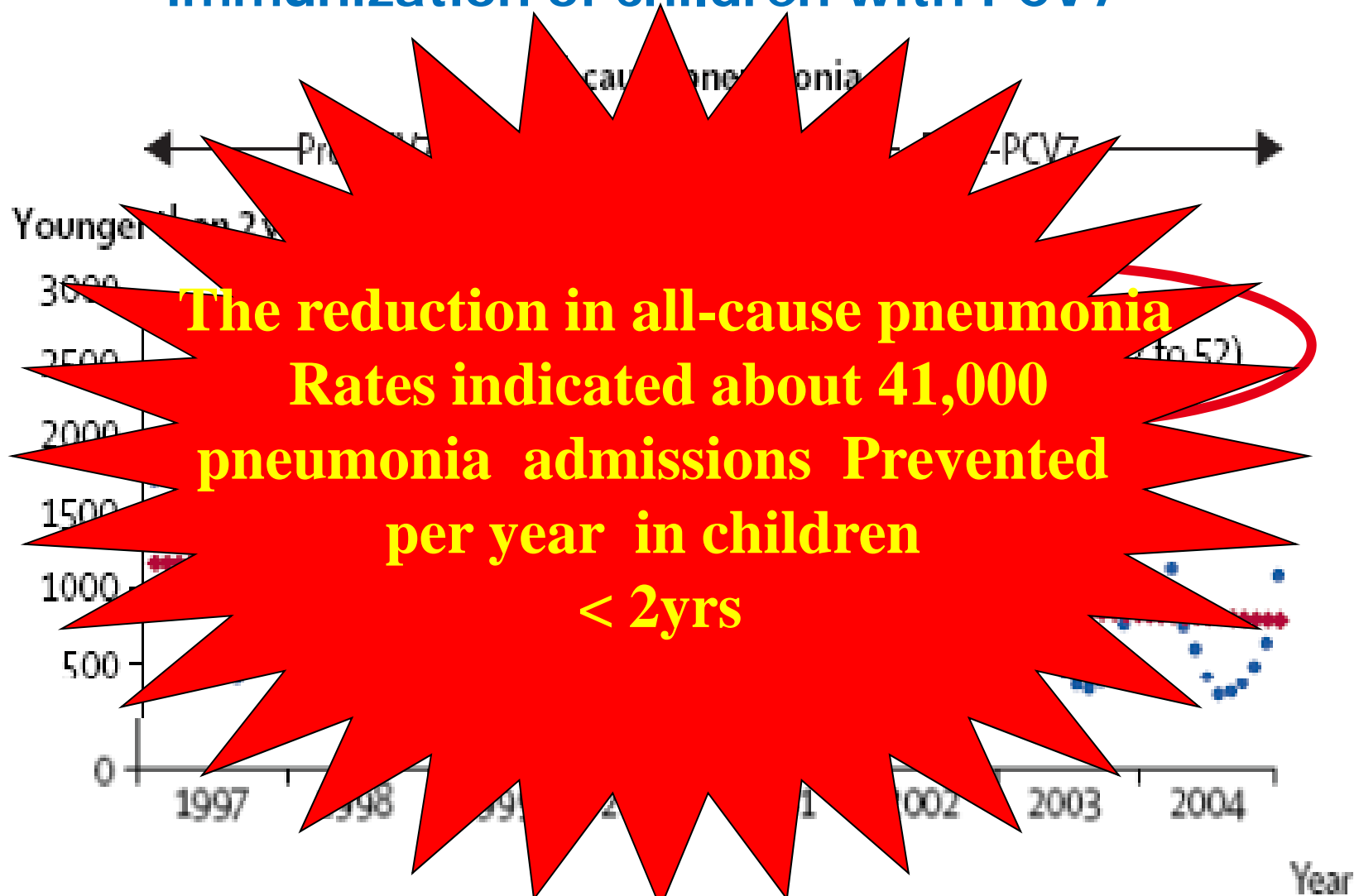
Figure 2: Comparison of **PICU** rates in children <5 years with CAAP with and without RSV, born 30-31, 32, 33-35 vs. ≥ 36 w GA during the RSV season (November – March)



Prevention



Trends in monthly US admission rates (1997–2004) for all-cause pneumonia before and after routine immunization of children with PCV7



PnCV Efficacy Against “Viral Pneumonia” – HIV(-) Fully Immunized

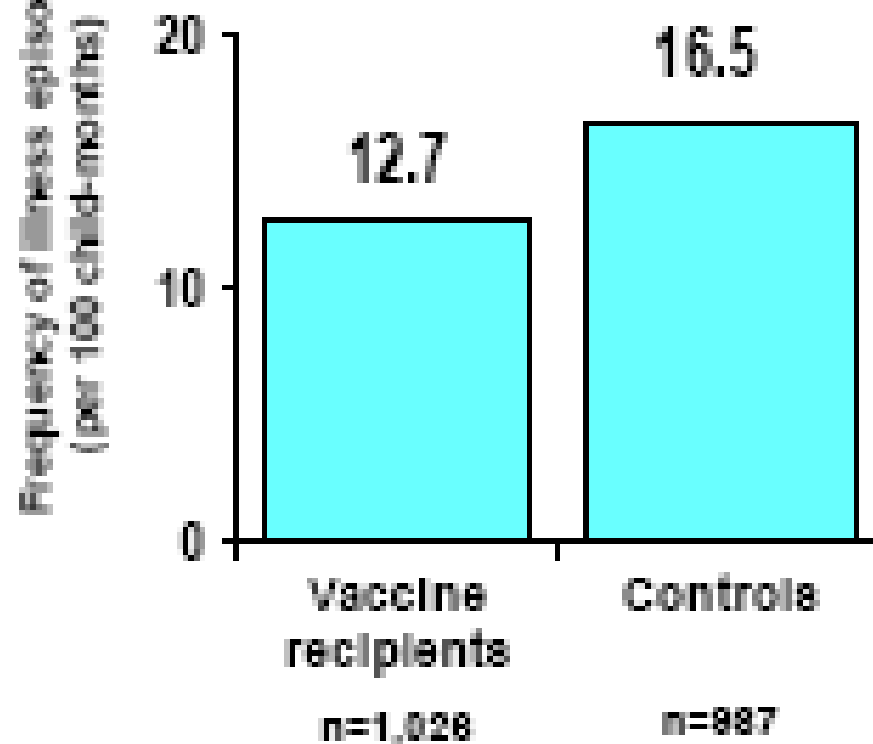


Virus	Cases	Controls	Vaccine efficacy (95% CI)	P
Influenza	21	32	34% (-14 - 62)	0.1
RSV	64	94	32% (6 - 50)	0.02
Parainfluenza	16	27	41% (-10 - 68)	0.09
Adenovirus	9	13	31% (-62 - 70)	0.4

A role for *Streptococcus pneumoniae* in virus-associated pneumonia

Effect of PCV9 on Lower Respiratory Morbidity in DCC Attendees (Age Window 15 - 35 m)

LR problems (mainly bronchitis/bronchiolitis/cough)



23% risk reduction
P = 0.015

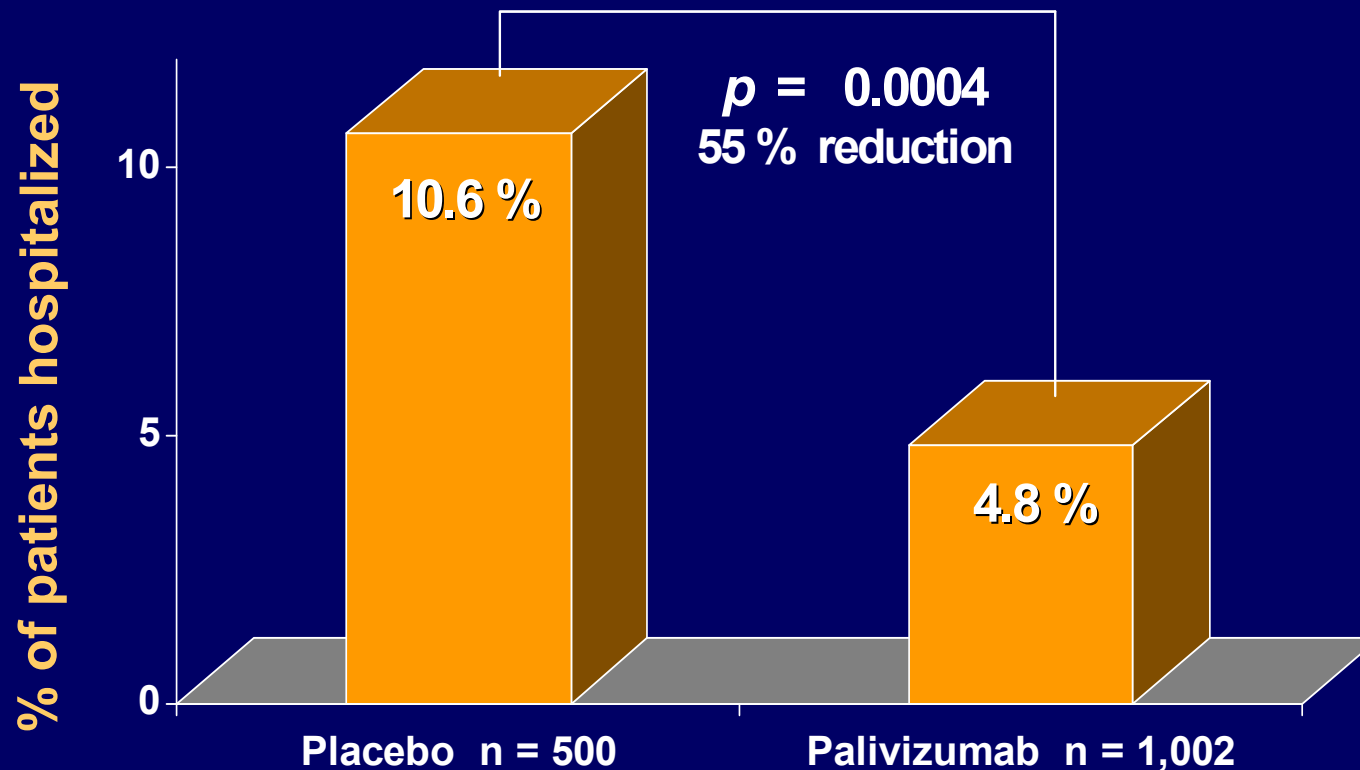
Synagis®

Mechanism of Action

לצפיה בסרטון הדגמת מנגנון הפעולה לחץ כאן.

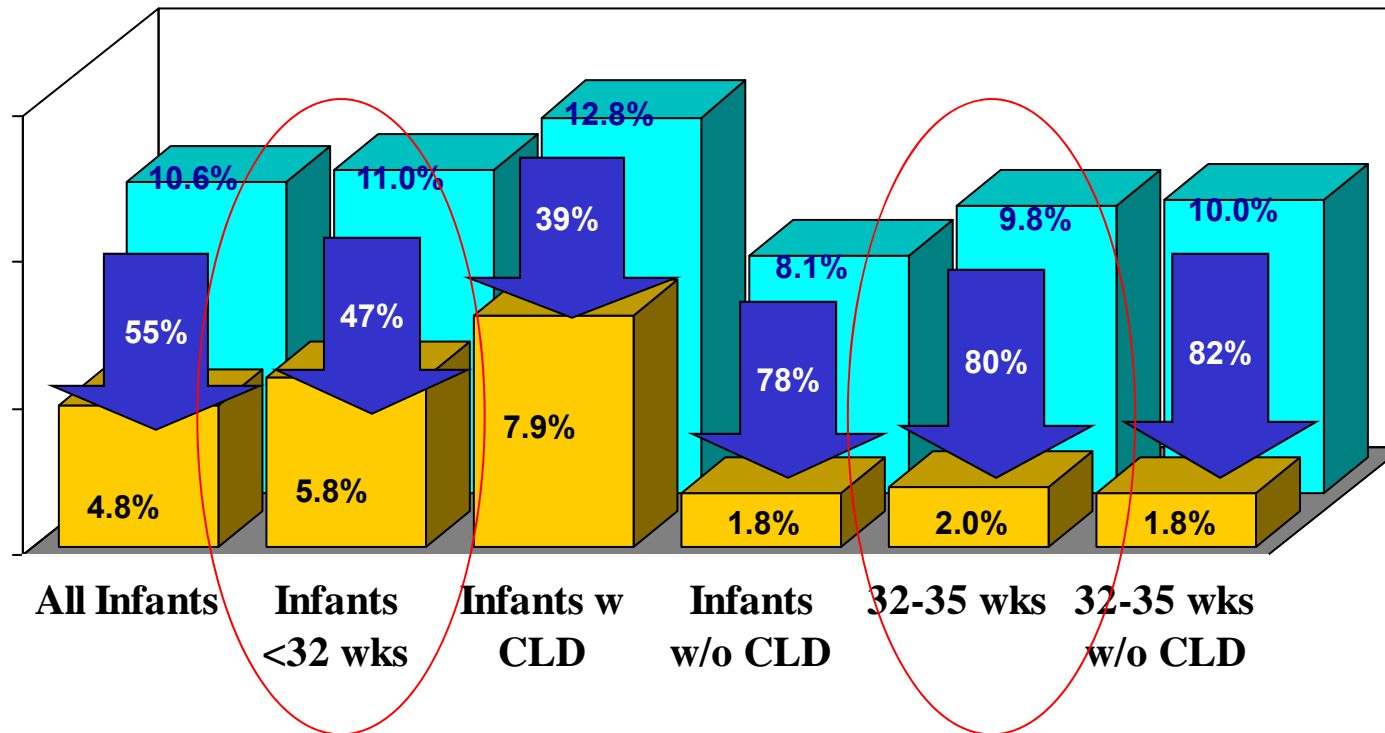
IMpact Trial – Efficacy Results

Primary Endpoint : RSV Hospitalizations

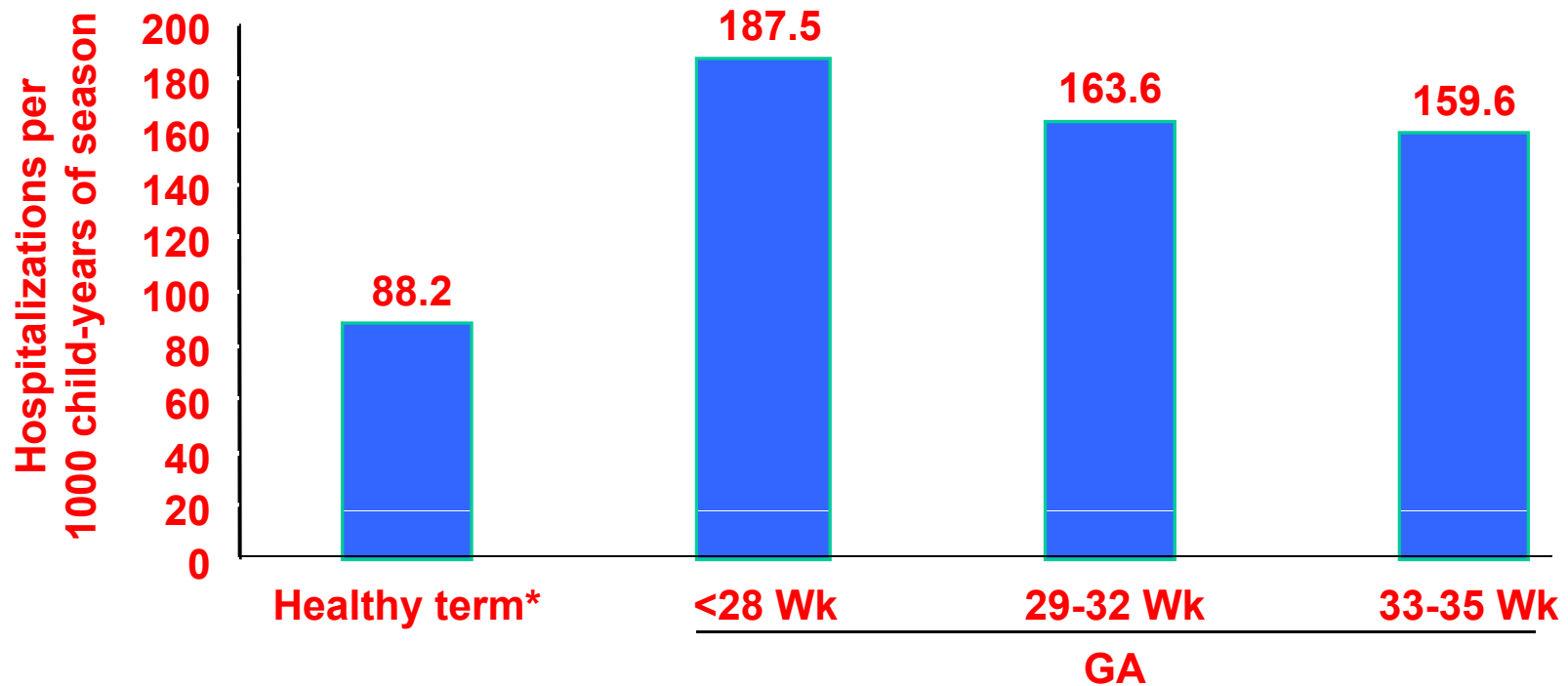


The Impact-RSV Study Group: Hospitalization Rates by Subgroup

■ Palvizumab Group ■ Placebo Group



RSV hospitalizations in the first 6 months of age are similar in all premature infants irrespective of GA

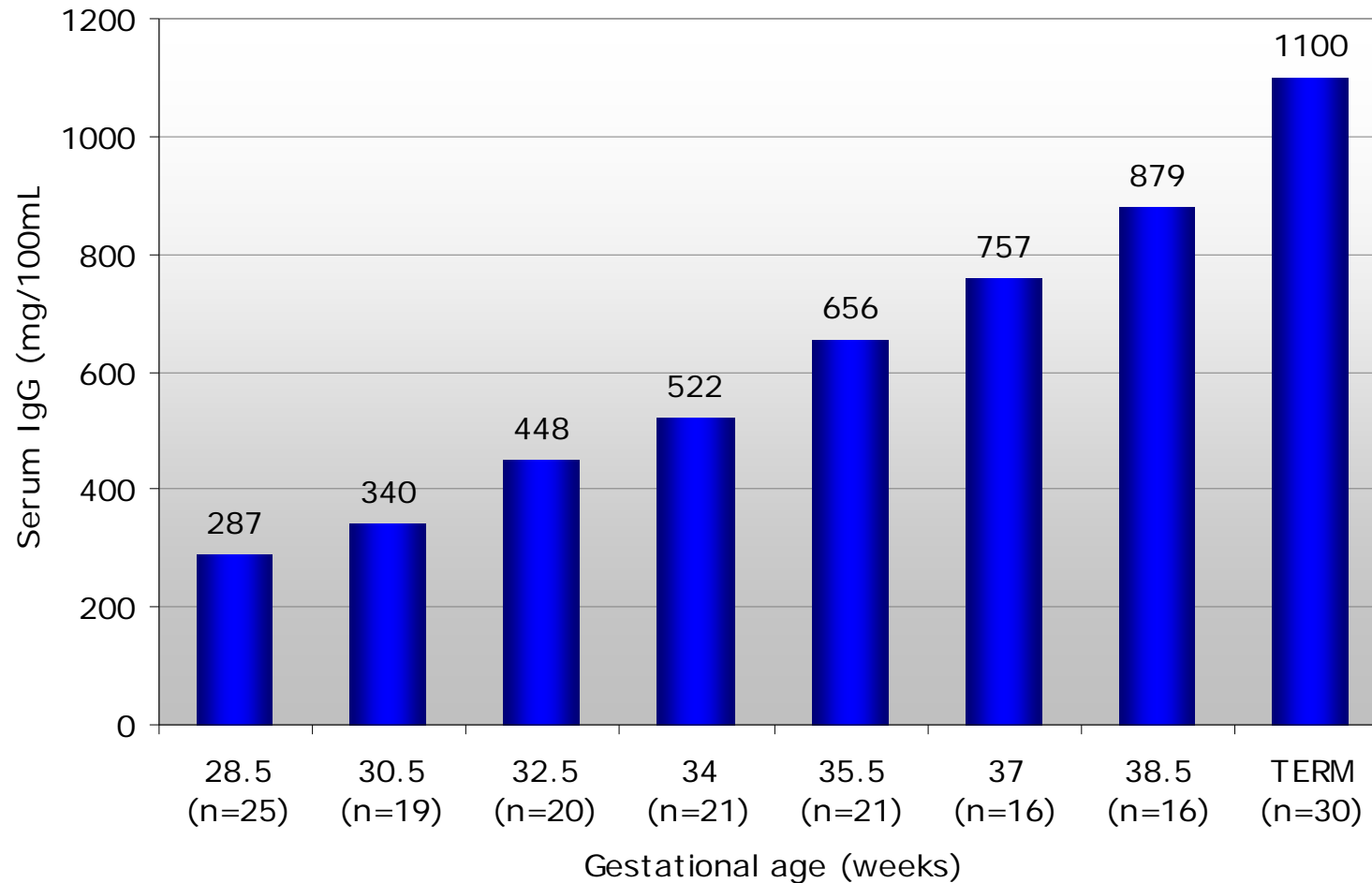


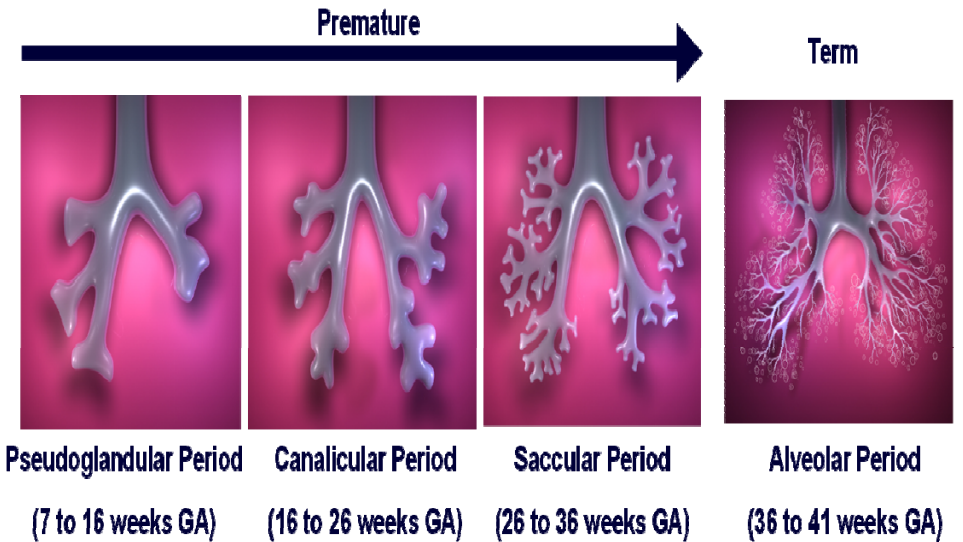
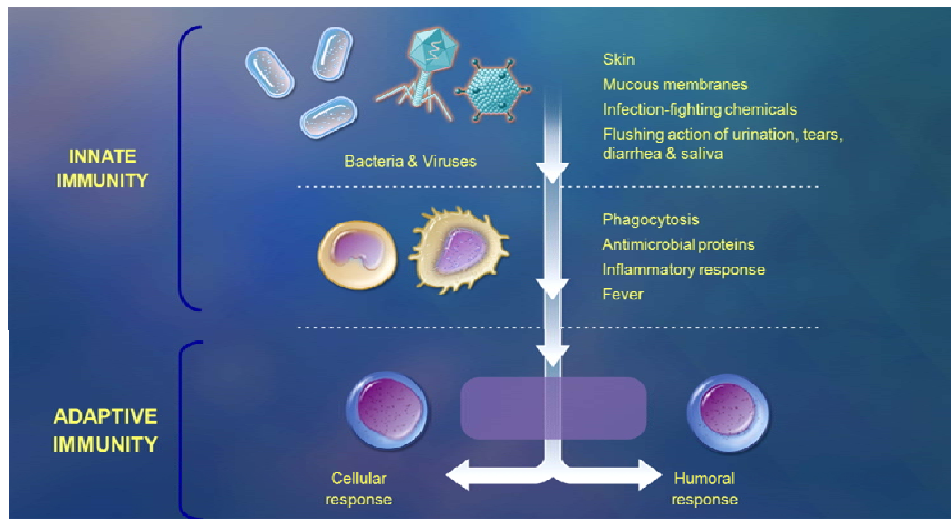
- Retrospective study of enrollees in Tennessee Medicaid, Jul 1989-Jun 1993, ≤ 3 years old
- Chart shows hospitalizations among infants ≤ 6 months old

* Infants of ≥ 36 weeks GA without other medical conditions.

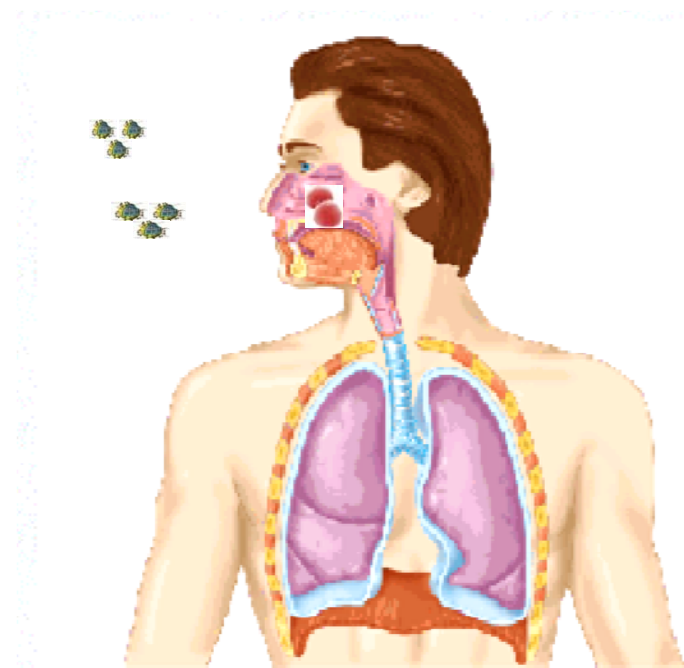
GA = gestational age.

Mean serum IgG levels increase with increasing gestational age





It is accepted that the pathogenesis of CAAP is micro aspiration of bacteria spreading from the nasopharynx to the lung



5. חיסון סביל למניעת זיהום RSV

Passive Respiratory Syncytial Virus (RSV) immunization

קיימים שני תכשירים המיועדים לחיסון סביל נגד זיהום שנגרם ע"י RSV:

- אימונוגלובולין הומני, הניתן דרך הווריד, RSV-IGIV. התכשיר אינו רשום בישראל.

- נוגדן מהומן (humanized) מונוקלונלי בשם Abbosynagis (Palivizumab), הניתן לתוך השריר, ונמצא כעת בשימוש בישראל:

5.1 טיב התכשיר*:

התכשיר בשם Abbosynagis, תוצרת חברה Abbott, מכיל Palivizumab - אימונוגלובולין "מהומן" מונוקלונלי IgG_{1k}, הפועל נגד זנים A ו-B של RSV. חומרים לא פעילים של התכשיר: histidine, glycine, mannitol. התכשיר אינו מכיל חומר משמר.

5.2 התוויות:**

התכשיר מומלץ לשימוש בעונת פעילות היתר של ה-RSV בישראל: מ-1 בנובמבר עד 31 במרץ.

א	ילדים שנולדו פגים הלוקים במחלת ריאות כרונית הזקוקים לטיפול בחמצן	עד גיל שנתיים
ב	ילדים שנולדו פגים הלוקים במחלת הריאות BPD (broncho-pulmonary dysplasia) שאובחנה אצלם ע"י צילום חזה אופייני וסימנים קליניים בגיל מתוקן של 36 שבועות הריון ושנזקקו לטיפול באחד מאלה: חמצן, משתנים, קורטיקוסטרואידים או מרחיבי סימפונות	עד גיל שנה
ג	ילדים שנולדו בטרם מלאו 31 שבועות הריון + 6 ימים.	עד גיל שנה
ד	ילדים הסובלים ממחלת לב מולדת ובהתקיים אחד מאלה: 1. ילדים המקבלים טיפול תרופתי לאי ספיקת לב. 2. ילדים עם יתר לחץ דם ריאתי בינוני עד חמור. 3. ילדים עם מחלת לב ציאנוטית.	עד גיל שנה
ה	ללא תלות בשבוע הלידה, שנולדו במשקל נמוך מ-1 ק"ג	עד גיל שנה
ו	ילדים ללא תלות בשבוע הלידה, הסובלים ממחלת ריאות כרונית קשה***.	עד גיל שנה

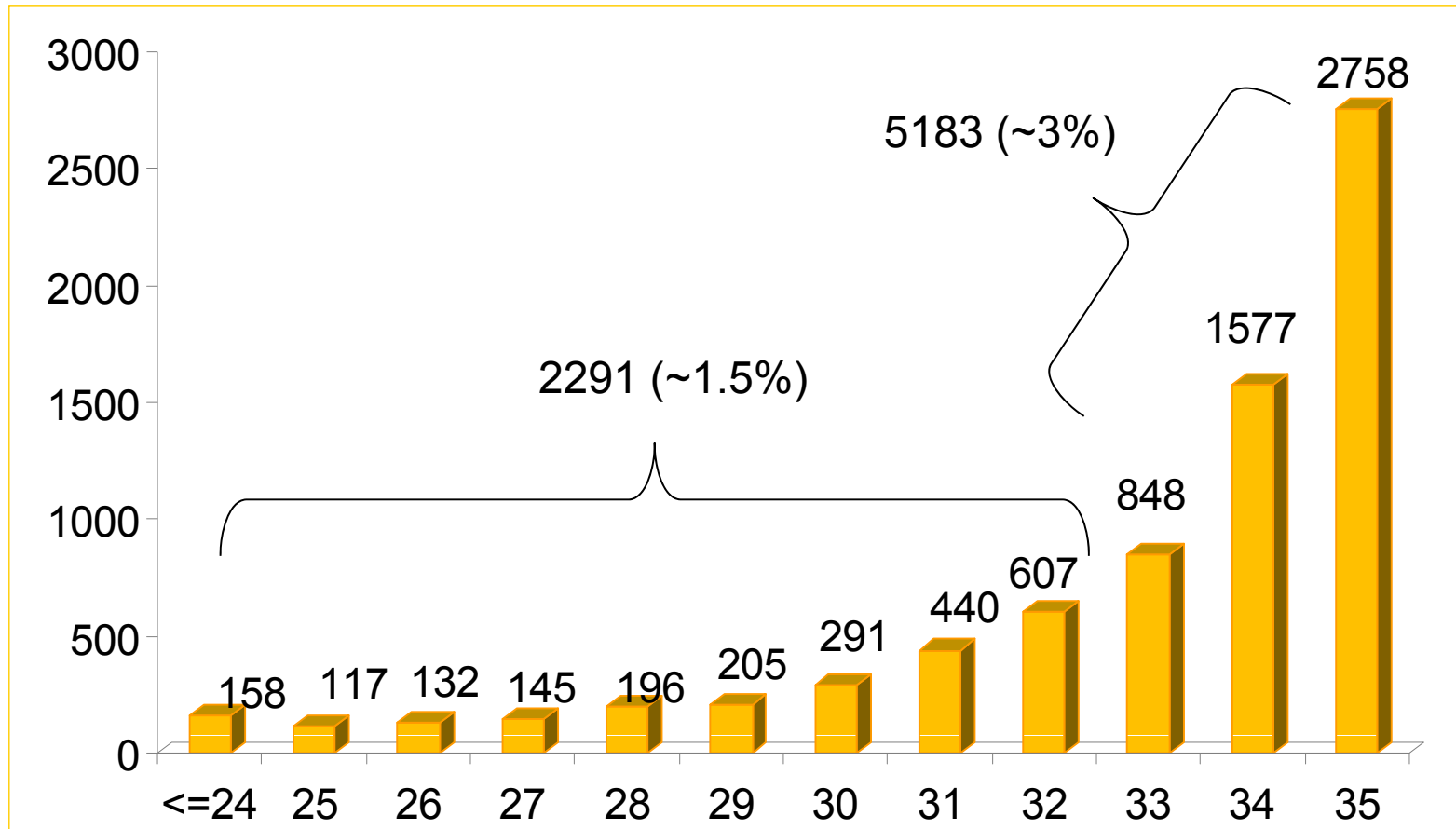
הערות:

- א. התכשיר אינו מיועד לטיפול במחלה פעילה הנגרמת ע"י RSV, אלא למניעת המחלה בלבד.
 - ב. צורך במתן התכשיר ייקבע ע"י רופא מומחה (רופא ריאות, רופא קרדיולוג או מומחה אחר שמטפל בילד), אך בהתאם להתוויות לעיל.
 - ג. אם בוצע ניתוח לב במשך עונת פעילות יתר של ה-RSV, תינתן מנה נוספת של Abbosynagis סמוך לאחר הניתוח במקרים שתוארו בסעיף 5.2, ד'.
 - ד. לכל הילדים הזכאים לטיפול מונע יש להמשיך ולתת את התכשיר עד תום עונת פעילות היתר של ה-RSV.
- * על פי עלון היצרן.

** התוויות לשימוש בתכשיר Abbosynagis הכלולות בסל השירותים של קופות החולים.

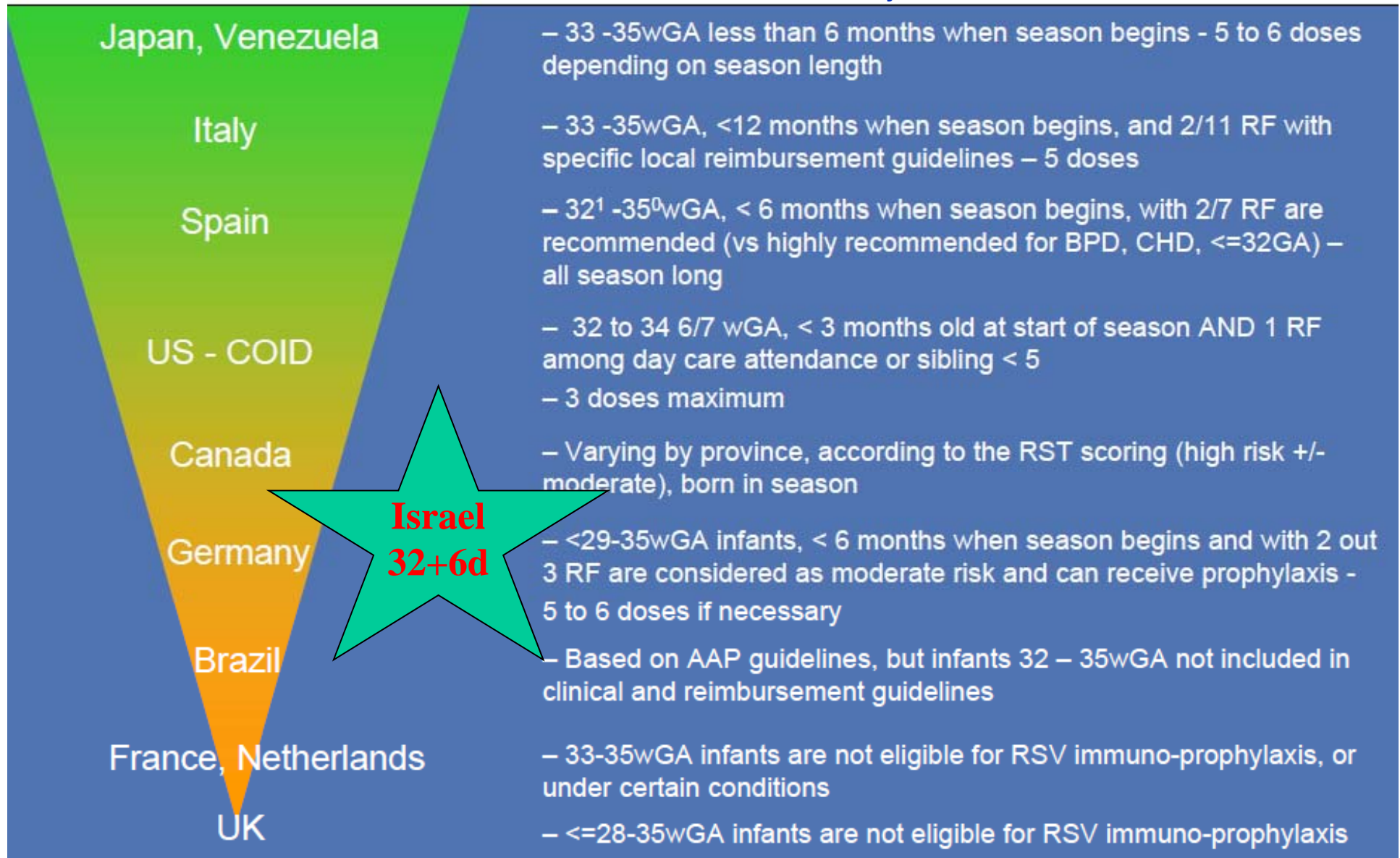
*** מחלת ריאות כרונית קשה מגדרת בילד המצוי בתחילת עונת RSV, כאשר הינו זקוק לטיפול במחלת הריאה הכרונית באחד מהבאים: חמצן, משתנים, סטרואידים בשאיפה, מרחיבי סימפונות בשאיפה, סטרואידים במתן סיסטמי.

Birth segmentation by wGA - 2007 (MOH data - Research Department)

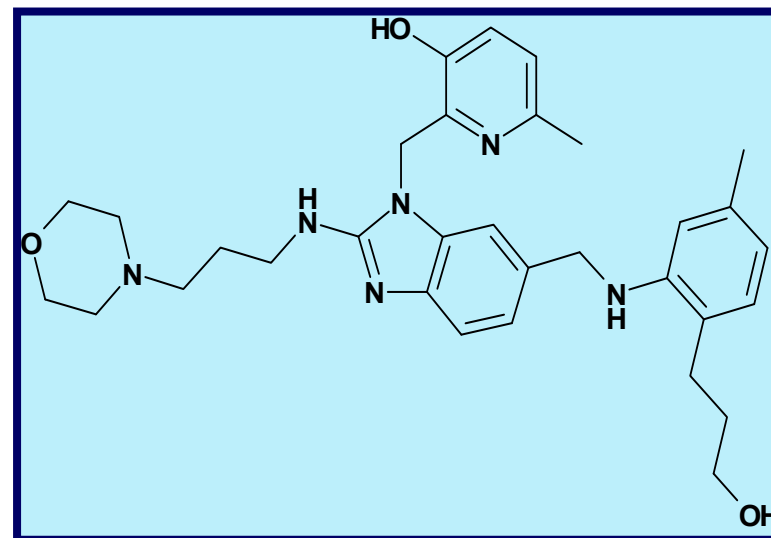
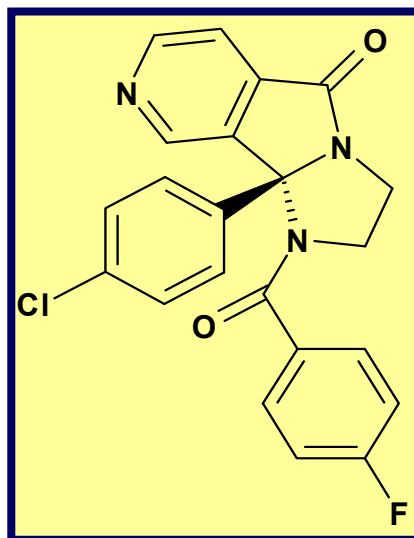
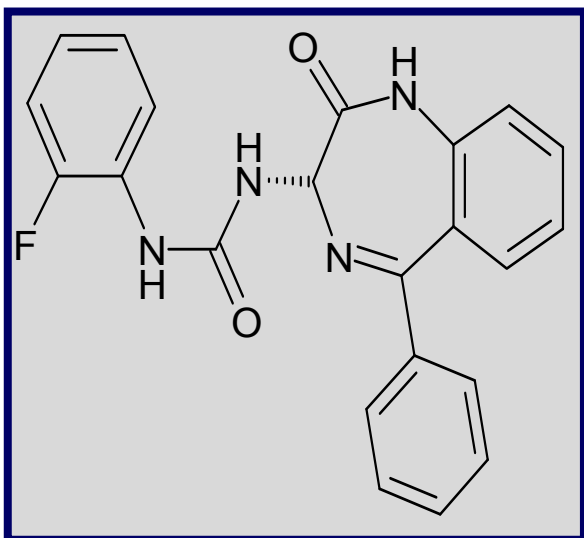


Guidelines in 10 Countries

Courtesy of MedImmune and Abbott International.
July 2009

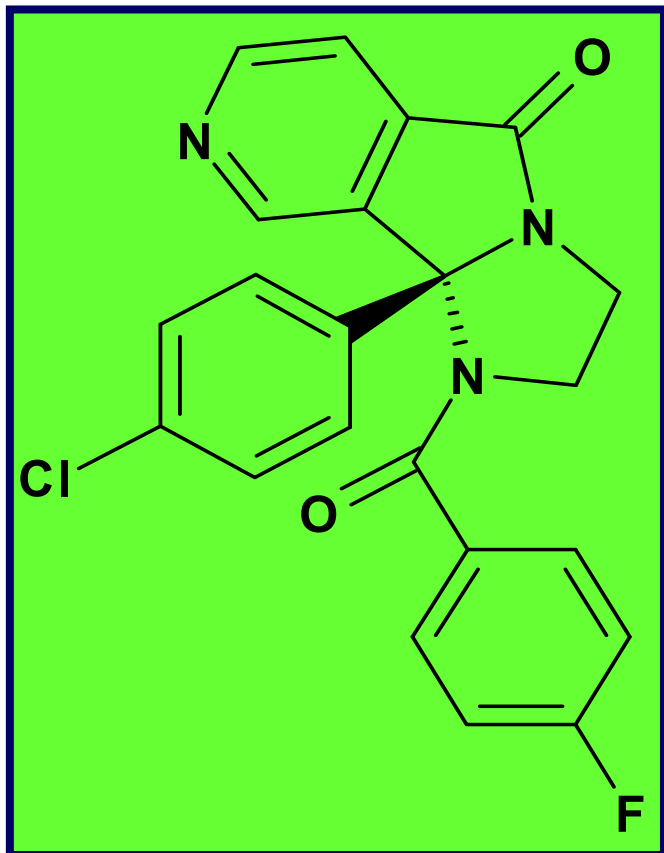


Antivirals for RSV: Update on small molecules



BTA 9981

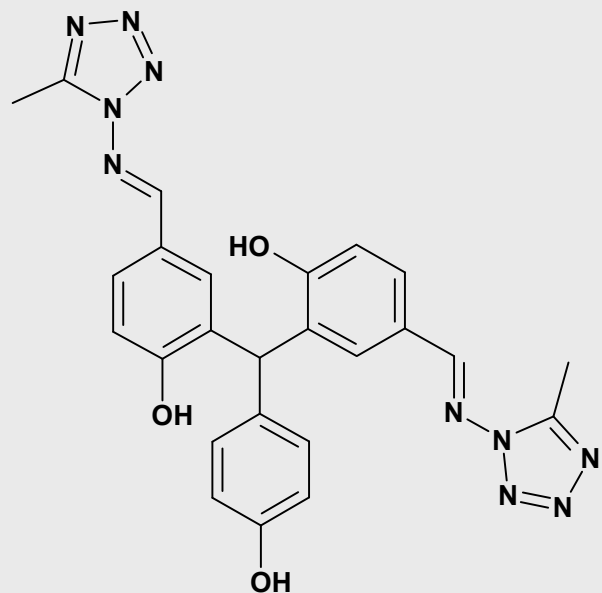
Biota & Medimmune/Astra Zeneca



Mechanism	Fusion inhibitor
Administration	Oral route
Bioavailability	100%
Animal models	Good Efficacy
Clinical studies	Phase 1
2nd Compound	Improved antiviral activity & solubility

MDT-637 (VP14637)

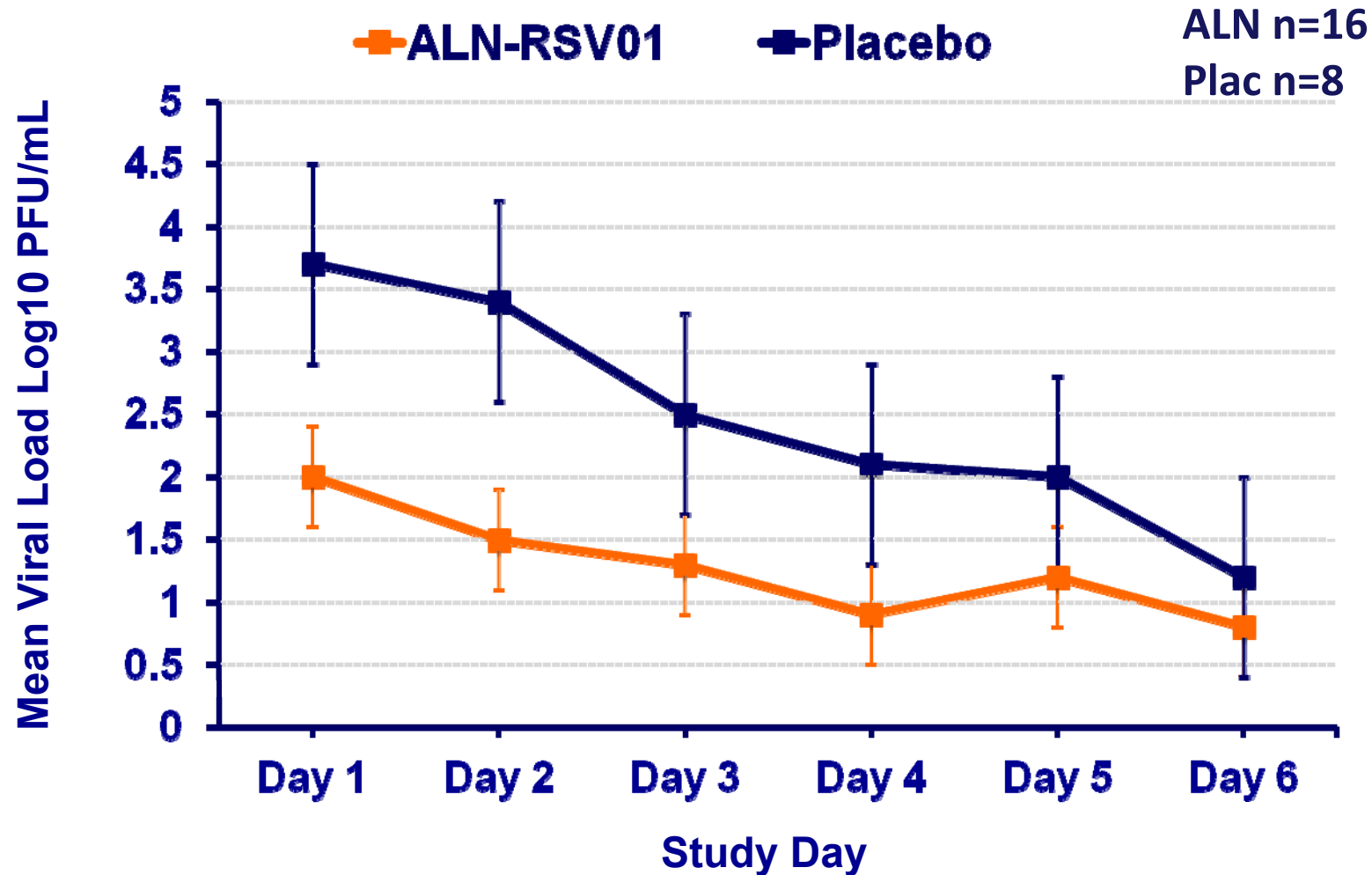
MicroDose Therapeutx & Gilead



MDT-637

Mechanism	Fusion inhibitor
Potency IC50 :	0.0006 μM
Formulation:	Dry powder
Administration:	Inhaler
Fine particle dose (<5 μm) 16 mcg projects 2 μM post-inhalation drug concentration, 3300x the IC50	
Clinical studies	Phase 1

Anti viral effect of ALN-RSV01 (siRNA) in lung transplant patients with RSV infection

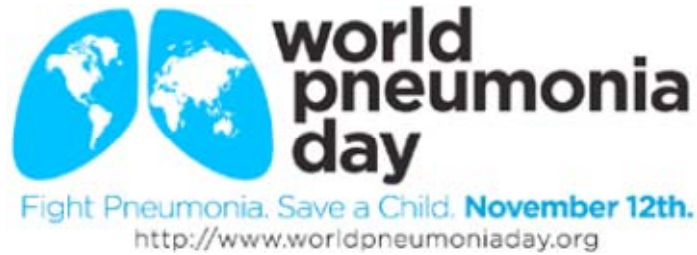


Take home message (1)

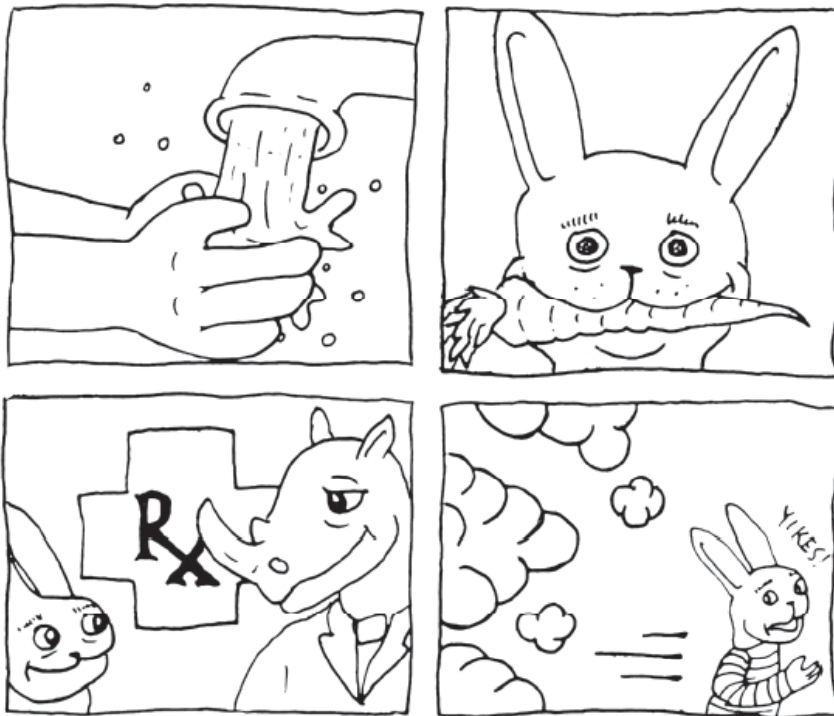
- Community acquired pneumonia in children is common worldwide
- There are different etiologies of CAP in children and it can vary from different viruses and different bacteria and in 30% it can be co-infection of virus and bacteria
- The viral infection proceed the bacterial infection and manipulate the host defense factors enable the bacteria to invade the lungs and to create infection leading to CAP
- RSV plays an important role to enhance *Streptococcus pneumoniae* to cause pneumonia in children

Take home message (2)

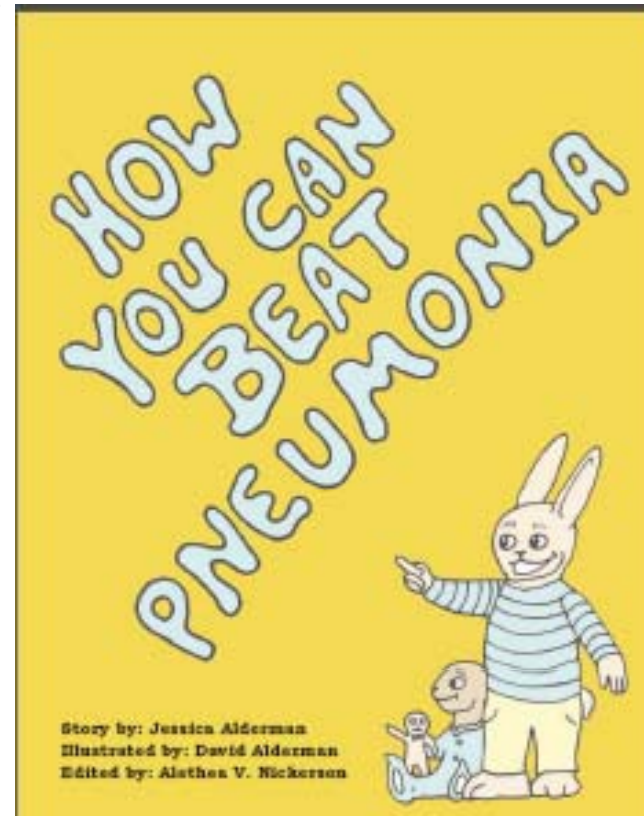
- Children <5y born 30-35 weeks gestational age are at a markedly increased risk for hospitalization and PICU admission due to RSV associated community-acquired alveolar pneumonia compared to those born ≥ 36 weeks gestational age
- Strategies for prevention of CAP should include vaccine for:
 - Bacteria: *S. pneumoniae*, *H. influenzae* and pertussis
 - Viral: Influenza and the RSV-IG in high risk children



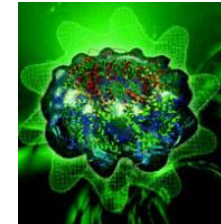
How You Can Prevent Pneumonia



“Remember, you can also avoid getting sick by: **washing your hands often, eating nutritious foods, visiting the clinic for check-ups and vaccines, and staying away from smoke.** Also, **mothers who feed their babies only breast milk for the first 6 months of their life will help keep infants protected from pneumonia,**” said the doctor.



Story by: Jessica Alderman
Illustrated by: David Alderman
Edited by: Alethea V. Nickerson



Comparison of CAP cases in children <5 years of age RSV positive and negative

	RSV Positive N= 699	RSV Negative N= 1517	p
GA <29 W N=61 (2.8%)	18 (29.5%)	43 (70.5%)	0.865
GA 30-31 N=39 (1.8%)	16 (41.0%)	23 (59.0%)	0.159
GA 32 N=29 (1.4%)	12 (41.4%)	17 (58.6%)	0.208
GA 33-35 N=128 (5.8%)	55 (42.9%)	73 (57.0%)	0.003

} P=0.014

- Only 1 was fully vaccinated RSV-
diagnosed at 21 months old
- 1 received only 2 doses-RSV (+) on April
- 2 received 1 dose

Death: 11 children
with RSV (+)
Premature 3:
only 1 27w not
RSV vaccinated
2 children 33w
(9mo) and 35 w
GA (2 wks)