

**Univ.-Prof. Dr. med. Heinz-J. SCHMITT**

Senior Medical Director, Pfizer Vaccines Europe

Thessaloniki, February 20th, 2018

# **CURRENT DEVELOPMENT IN PEDIATRIC VACCINATION**

# Selected Case Fatality Rates

Germany, 1938/39

Age (y)	Pertussis	Measles	Diphtheria
<1	<b>1827</b>	542	353
1–4	655	<b>863</b>	<b>2502</b>
5–9	34	139	1585
10–15	6	25	1044
<b>Total</b>	<b>2522</b>	<b>1569</b>	<b>5484</b>
<b>Total: 9575</b>			

# Vaccination Calendar for Children

Vaccines	Current Discussions
Diphtheria	Reduced uptake results in outbreak (Russia early 1990s)
Tetanus	Rare – benchmark for new vaccines?
Pertussis	How often and which ages?
<i>Invasive H. influenzae b</i>	Conjugates: Booster needed around 12 months
Polio	Eradication possible? Switch from OPV to IPV?
HBV	First anti-cancer vaccine
Rotavirus	Intussusception – reduction of mortality / morbidity
DTaP/TdaP combos	There is a limit ?!
MenC	Herd effects
MenACWY	Epidemiology – trend to quadrivalent; outbreaks Y, W
MenB	Bexsero®: All ages; Trumenba®: As of 10 years
PCV	7-, 10-, 13 valent ... not only the numbers differ

# Vaccination Calendar for Children

Vaccines	Current discssions
Measles	1996: Eliminated Finland – EU outbreaks politically accepted
Mumps	Various outbreaks – vaccine efficacy?
Rubella (CRS)	Eliminated in many countries
Varicella	Vaccinate or not? 2 doses needed
HPV	2 <sup>nd</sup> cancer vaccine – “sex does not sell” – now 9-valent product
Influenza	Would be ideal to vaccinate children (NEJM 2001 (344) 889-896)
Local Programs	HAV, Japanese Encephalitis, YF, TBE, (Dengue, Malaria)
Others	...

# Vaccination Calendar for Adults

Vaccine	Comment
MMR-V	Catch-up/boosters as needed
Polio	≥4 doses sufficient for life?
Td (aP)	Every 10 years? aP every 10 years?
Influenza	Annual dose TIV, QIV,
Pneumococcus	Local recommendations, Herd effects
Zoster Vaccine	Merck live vaccine; GSK adjuvanted vaccine (Shingrix™)
Others	MenACWY, MenB,
Local programs	TBE, HBV, HAV, ...

# USA: Cases Prevented by Vaccination in 10 Years (1994–2013; Numbers x 1,000)

Vaccine-preventable Disease	Illnesses	Hospitalizations	Deaths
Diphtheria	5,073	5,073	507.3
Tetanus	3	3	0.5
Pertussis	54,406	2,697	20.3
<i>Haemophilus influenzae</i> type b	361	334	13.7
Polio	1,244	530	14.8
Measles	70,748	8,877	57.3
Mumps	42,704	1,361	0.2
Rubella	36,540	134	0.3
Congenital rubella syndrome	12	17	1.3
Hepatitis B	4,007	623	59.7
Varicella	68,445	176	1.2
<i>Pneumococcus</i> -related diseases	26,578	903	55.0
Rotavirus	11,968	327	0.1
<b>Total</b>	<b>322,089</b>	<b>21,055</b>	<b>731.7</b>

# Vaccine Production Today

- Closed systems
- Controllability –  
Quality control
- Aseptic handling
- Purification of products
- Fewer additives

# Side Effects of Vaccines



Reactogenicity (local; systemic)



Anaphylaxis



Technical errors



Vaccine-specific side effects



# Adverse Events Following Vaccination



## Side Effects (see previous slide)

- Causality proven
- Reportable



## Unknown Causality

- Coincidence versus causality
- Various sets of criteria for causality assessment
  - (e.g. IOM, WHO, ...)
- Difficult to explain to patients
- Reportable if serious (death, disability, severe disease)

# Adverse Events Following Immunization (AEFI)



## Side Effects (see previous slide)

- Smallpox: Encephalitis, death
- BCG: Dissemination, death
- Influenza: GBS
- OPV: paralysis (VAPP)
- RV: Intususseption
- Any Vx: Anaphylaxis
- AS03-Flu: Narcolepsy?



## Unknown Causality

- Autism: MMR
- MS: HBV
- Crohn's disease: MMR
- German language: Infanrix hexa
- Pregnancy post HAV

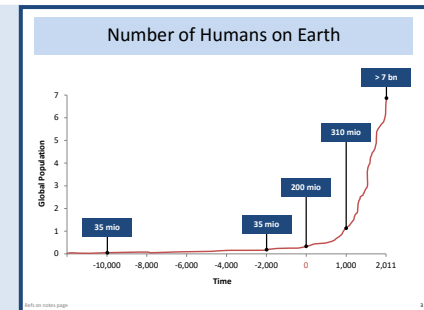
**All NOT causal**

**CAN WE STOP HERE?  
CAN WE DO BETTER?**

# Infectious Diseases Will Increase in the Future, Because...

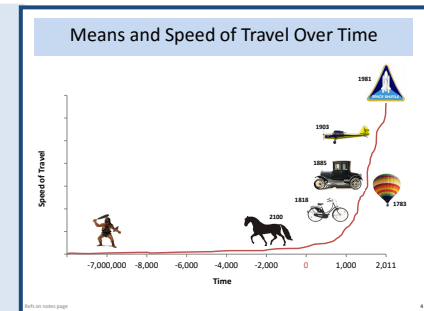
## There will be more microbes,

- The number of humans increases
- The number of animals increases
- Climate change favors geographic expansion



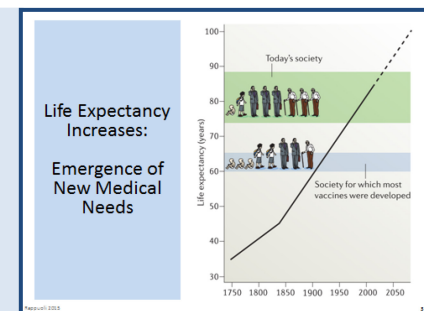
## There will be increased exposures,

- The number of humans increases
- The number of animals increases
- Travel increases
- New risk-behaviours



## There will be risk increases.

- Ageing society
- Medically induced reduced immunity



# THE CHALLENGES

# Success of Vaccination: 4 Challenges



**SCIENCE**



**FINANCING**



**ACCEPTANCE**



**CO-OPERATION**

# Success comes from having ...



Goals



Plan



Implementation



Evaluation

**WHERE ARE WE? WHICH VACCINES  
WILL COME TOMORROW?**



# Recently Licensed New Vaccines\*

Malaria	RTS,S (Mosquirix™)
Dengue	Dengavax™
HPV9	Gardasil-9
Quadrivalent influenza vaccine (QIV)	Various
Cell culture based influenza vaccines	Various
Intradermal application	Fluzone intradermal™, Rabies
Inactivated, adjuvanted zoster vaccine	Shingrix™
Others	

\*Not complete. Western world only. Schmitt data on file.

# New Vaccines Next 5 – 10 Years?\*

„Improved vaccines“	Comments
Pneumococcal conjugate vaccines (PCV15, PCV15+)	Proteins?
Meningococcus ABCWY	Medical need?
Various combinations	Improved uptake
New Developments	Comments
Group B streptococcus (GBS)	Maternal immunization
Staphylococcus aureus	Regulatory pathway
Norovirus	
Clostridium difficile	
Cytomeglovirus	Vaccination goal?
RSV?	Feasibility?

\*Not complete. Western world only. Schmitt data on file.



# HEALTH IMPACT NEWS

News that Impacts Your Health that Other Media Sources May Censor!

## There Are 271 New Vaccines in Big Pharma's Pipeline

sanofi pasteur prevention of Clostridium difficile ACE BioSciences prevention of traveler's diarrhea caused by Campylobacter jejuni ACE BioSciences prevention of traveler's diarrhea caused by Escherichia coli sanofi pasteur diphtheria, tetanus, pertussis Phase III DTP vaccine Aeras Global tuberculosis Novartis Vaccines prevention of influenza A infection (H5N1 subtype) Antigenics treatment of herpes simplex virus BioSante Pharmaceuticals anthrax Phase I/II vaccine Intercell USA anthrax KaloBios Pharmaceuticals Pseudomonas aeruginosa infections Aduro BioTech treatment of hepatitis C Emergent BioSolutions anthrax vaccine AlphaVax prevention of influenza virus infections in the elderly DynPort Vaccine botulism vaccine Inviragen Chikungunya virus vaccine Celldex Therapeutics cholera vaccine (live attenuated) ChronTech Pharma hepatitis C (DNA vaccine) Virionics prevention and treatment of hepatitis C Vical prevention of cytomegalovirus (DNA vaccine) AlphaVax prevention of cytomegalovirus infections Hawaii Biotech prevention of dengue fever GlaxoSmithKline prevention of dengue fever (tetravalent) Acambis mild to severe dengue fever sanofi pasteur DTP-Hep B sanofi pasteur diphtheria, tetanus, pertussis, polio, hepatitis B, polio, Hib Dynavax treatment of hepatitis B Crucell prevention of Ebola virus infections Vical prevention of Ebola virus infections GenPhar Ebola virus vaccine GlaxoSmithKline prevention of infectious mononucleosis (Epstein-Barr virus) BioSolutions Escherichia coli infections Celldex Therapeutics prevention of cholera, Escherichia coli infections Novartis Vaccines helicobacter pylori infections in adults and children sanofi pasteur influenza virus infections (new mass production method) sanofi pasteur prevention of influenza virus (intradermal micro-injection) Protein Sciences influenza virus infections GlaxoSmithKline rotavirus infections in infants GlaxoSmithKline prevention of cytomegalovirus (recombinant vaccine) GlaxoSmithKline influenza virus (trivalent, thimerosal-free) for children ages 3-17 GlaxoSmithKline prevention of influenza virus GlaxoSmithKline prevention of Streptococcus pneumoniae GlaxoSmithKline prevention of diphtheria, tetanus, pertussis, Haemophilus infections, hepatitis B, meningococcal group C infections, poliomyelitis (infants) GlaxoSmithKline prevention of Haemophilus and pneumococcal infections GlaxoSmithKline prevention of Haemophilus and pneumococcal infections GlaxoSmithKline prevention of influenza virus infection in children GlaxoSmithKline prevention of influenza A virus (H1N1 subtype) for children and infants GlaxoSmithKline staphylococcal infections MedImmune influenza A virus (H5N1 subtype) intranasal Novavax prevention of influenza A virus infection Hawaii Biotech prevention of West Nile virus infection Novartis Vaccines helicobacter pylori infections GlaxoSmithKline hepatitis B GenPhar hepatitis B Novartis Vaccines treatment of hepatitis C GlaxoSmithKline hepatitis E (recombinant) Dynavax prevention of hepatitis B Pfizer treatment of herpes simplex virus infections (DNA vaccine) AuRx prevention and treatment of herpes simplex virus infections sanofi pasteur diphtheria, tetanus, pertussis, hepatitis B, polio, Hib Intercell prevention of influenza virus seasonal influenza Novartis Vaccines prevention of herpes simplex virus infections Acambis prevention of encephalitis virus Bavarian Nordic smallpox vaccine sanofi pasteur influenza A virus (H1N1 subtype) in adolescents, children and infants CSL Behring prevention of influenza A virus (H1N1 subtype) for the elderly Baxter Healthcare prevention of influenza A virus (H1N1 subtype) Vical prevention of influenza A virus (DNA - H1N1 subtype) Baxter Healthcare prevention of influenza A virus (H5N1 subtype) DynPort Vaccine influenza virus Antigen Express influenza virus infections H5N1 vaccine Novavax prevention of influenza virus (particle vaccine) Dynavax prevention of influenza virus infections Vaxin influenza virus infections (intranasal) Abbott Laboratories prevention of influenza virus (cell culture-derived) Intercell prevention of Japanese encephalitis in children Novartis Vaccines malaria vaccine (U.S. Naval Medical Research Center) Vical malaria vaccine BioSante Pharmaceuticals prevention of malaria (U.S. Naval Medical Research Center) GenVec malaria vaccine (U.S. Naval Medical Research Center) Crucell malaria vaccine Sanaria malaria vaccine GenPhar Marburg virus (DNA vaccine) MedImmune parainfluenza virus infections in children and infants MedImmune prevention of respiratory syncytial virus infections in infants MedImmune prevention of parainfluenza virus infections in children and infants MedImmune prevention of influenza virus (quadrivalent) for adolescents and children sanofi pasteur Neisseria meningitidis A, C in toddlers 9 months-12 months GlaxoSmithKline prevention of Neisseria meningitidis groups C and Y, Haemophilus influenzae type B, and tetanus toxoid sanofi pasteur meningitis in infants Novartis Vaccines meningococcal group B infections vaccine group B Novartis Vaccines meningococcal group A, C infections in children Novartis Vaccines meningococcal group A, C infections in infants GlaxoSmithKline prevention of malaria (recombinant vaccine) NanoBio prevention of influenza virus (intranasal) GlaxoSmithKline prevention of influenza virus inactivated split-trivalent vaccine GlaxoSmithKline prevention of Neisseria meningitidis groups A, C in children LigoCyte Pharmaceuticals norovirus infections (intranasal) Novartis Vaccines prevention of influenza virus Protein Sciences prevention of influenza A pandemic (H5N1 subtype) Meridian Biosciences parvovirus infections Crucell prevention of influenza virus infections Pfizer meningococcal group B infections (meningococcal "plague" vaccine) DynPort Vaccine Yersinia infections (injectable) Baxter Healthcare prevention of seasonal influenza virus GlaxoSmithKline prevention of influenza A virus ("pre-pandemic") Pfizer prevention of pneumococcal infection in the elderly (Prevnar 13 Adult™) sanofi pasteur rabies vaccine BioSante Pharmaceuticals ricin poisoning ("biodefense" vaccine) Soligenix ricin poisoning sanofi pasteur prevention of rotavirus infections Bharat Biotech prevention of rotavirus infections Emergent BioSolutions anthrax (Fast Track) "protective antigen" vaccine Inhibitex staphylococcal infections Vical prevention of severe acute respiratory syndrome (SARS) coronavirus infections Emergent BioSolutions shigella infections GlaxoSmithKline prevention of herpes simplex virus infections PharmAthene anthrax ("protective antigen" - rPA) BioSante Pharmaceuticals staphylococcal infections ("biodefense" vaccine) Nabi Biopharmaceutical prevention of staphylococcal aureus infections GlaxoSmithKline prevention of staphylococcal aureus infections Nabi Biopharmaceutical prevention of streptococcal B infections Emergent BioSolutions prevention of streptococcal infections Novartis Vaccines prevention of streptococcal infections sanofi pasteur prevention of meningitis and pneumonia (tetravalent) Inviragen treatment of dengue fever Intercell USA prevention of traveler's diarrhea due to E. coli ("patch" technology) GlaxoSmithKline tuberculosis Aeras Global TB prevention of tuberculosis in young children GlaxoSmithKline prevention of tuberculosis in adults sanofi pasteur prevention of tuberculosis DynPort Vaccine tularemia Emergent BioSolutions prevention of typhoid (live typhoid organisms - oral vaccine) Novartis Vaccines prevention of typhoid fever Celldex Therapeutics typhoid fever Merck prevention of herpes zoster (shingles) Merck hepatitis B in infants Merck human papillomavirus infections Merck staphylococcal infections GlaxoSmithKline prevention of varicella zoster virus VaxInnate prevention of influenza A virus VaxInnate influenza A virus infections in elderly patients VaxInnate prevention of influenza A virus (H1N1 subtype) Inovio Pharmaceuticals human papillomavirus infections Inovio Pharmaceuticals prevention of influenza A virus (H5N1 subtype) Xcellerex prevention of yellow fever

- See more at: <http://healthimpactnews.com/2015/there-are-271-new-vaccines-in-big-pharmas-pipeline/#sthash.mrVonyMf.dpuf>

## **To successfully get the benefits of a new vaccine you need:**

1. Someone who takes the risk to invest
2. Pathway and criteria for licensure
3. Transparent criteria for recommendations and reimbursement
4. A national immunization program (NIP)

**THANKS FOR YOUR ATTENTION**