HIGH RISK IMMUNISATION

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Overview
- Immunology
- Responses to vaccines
- Pregnancy
- The Elderly
- Herpes Zoster
  - Vaccination
  - Contraindications

Immunology
- Passive Immunity
  - Antibodies
  - Maternal – placental transfer and breast feeding
- Active Immunity
  - White Blood Cells
    - T Cells (Lymphocytes) – Cellular response
    - B Cells (Lymphocytes) – Antibodies
- Prevention of infection may be achieved only by vaccine-induced antibodies
- Disease attenuation and protection may be supported by T cells, even in the absence of specific antibodies.

Immune Response

Vaccines
- ‘Prime’ the immune system by mimicking natural infection
- Main determinants
  - Nature of the vaccine antigen
  - Intrinsic immunogenicity
- Live vaccine
  - Excellent vaccines – weakened/attenuated virus
  - Healthy people can’t get the disease from vaccine
  - Downside: ‘live’ virus → Contraindications
- MMR, Yellow Fever, Herpes Zoster
- Inactivated vaccine
  - Components are inactivated and not ‘live’
  - Downside – multiple injections / boosters
  - IPV, Hep A, Rabies
**Vaccines**

- Subunit/Conjugate vaccine  
  - Antigens that best stimulate the immune system  
  - Outer coating of sugar (polysaccharides)  
  - Attach toxoids from the bacteria to the polysaccharide  
  - Pneumococcal, Pertussis, Meningococcal, Influenza, HPV

- Toxoid vaccine  
  - Bacterial toxin is the main cause of illness – inactivated toxin  
  - Diptheria, Tetanus  
  - Vaccination is not just the jab! You need to punch it as well!  
  - ENTER DETAILS ON AIR

**Development Medicine**

Major Development periods:

- 1st Trimester (weeks 0-12) - embryonic \(\rightarrow\) foetal periods  
  - Major Organs (weeks 5-12)  
  - Limbs and bones  
  - Brain, spinal cord and lungs continue to develop  
  - Vulnerable time period - drugs / infection

- 2nd Trimester - (weeks 13-24) - foetal period  
  - Continued development  
  - 24 weeks – chance of survival out of the uterus

- 3rd Trimester - (weeks 25+)  
  - Maturation of lungs / movement  
  - Birth – 1 year – Development of immune system

**Immunology: Pregnancy**

- Passive immunity to foetus  
  - Placental transfer (6-9 months)  
  - Maternal IgG antibodies against the pathogens present in its surroundings  
  - Full maturation of immune system > 6 months  
  - Breast Milk  
    - Secretory IgA antibodies  
    - Lactoferrin can destroy microbes  
    - Non-absorbed milk oligosaccharides block attachment of microbes to the infant’s mucosae

- The Influenza shot given during pregnancy has been shown to protect both the mother and her baby for several months after birth

**Pregnancy and Influenza (mum)**

- Changes to the immune system, heart, and lungs during pregnancy  
- Influenza pandemic (1918) – Mortality (27–45%)  
- Influenza pandemic (2009) - 9.1% of patients admitted to ICUs in Australasia were pregnant  
- Pregnant women with influenza more likely to be hospitalised than non-pregnant women  
  - This risk increases with gestation and pre-existing medical conditions  
- The Influenza shot given during pregnancy has been shown to protect both the mother and her baby for several months after birth
Pregnancy and Influenza (Bub)

- 1st Trimester
  - Unclear – Possible increased risk of congenital defects
  - Maternal hyperthermia → neural tube defects
- Entire Pregnancy
  - Spontaneous miscarriage, low birthweight, preterm delivery
  - Maternal hyperthermia → neural tube defects

- Entire Pregnancy
  - Spontaneous miscarriage, low birthweight, preterm delivery

- Influenza vaccination during pregnancy decreased all-cause acute lower respiratory infection hospitalization during the first 3 months of life
  - Possible protection against subsequent bacterial infections that influenza infection might predispose to.

Pertussis Vaccination

- Pertussis Immunisation in 3rd Trimester
- Protect the infant in the first few months of life
- Up to 50% of neonatal pertussis cases are hospitalized
- The recommended time → week 28th
- EVERY pregnancy
- 2 weeks to generate an immune response and further transmit to baby

Cross-sectional study on factors associated with influenza vaccine uptake and pertussis vaccination status among pregnant women in Germany

- Vaccinated against seasonal influenza (23.2%)
- Major reasons for being unvaccinated
  - Lack of confidence in the vaccine (60.4%)
  - Vaccination was not necessary (40.3%)
- Influenza vaccination during pregnancy was associated:
  - received influenza vaccine in the previous season
  - having received a recommendation from a physician
  - high level of vaccine-related knowledge
  - Pertussis vaccine in the past 10 years (22.5%)
  - receiving seasonal influenza vaccination annually

Maternal uptake of pertussis cocooning strategy and other pregnancy-related recommended immunizations

- Influenza vaccine (20.3%)
- Pertussis vaccine (13.0%)*
- Receiving a recommendation from a healthcare provider (HCP) was an independent predictor for receipt of both pertussis and influenza vaccine

Knowledge of availability, language barriers
Key Points

- Influenza
  - 1st trimester: febrile illness can cause fetal abnormalities
  - 3rd Trimester: Preterm Birth, low birth weight
  - Early months of life – protective effects
  - Recommendation: Any time in pregnancy
- Pertussis
  - Neonate / Infant – passive protection for high risk period
  - Recommendation: During 3rd trimester (week 28)
  - These vaccines are SAFE
- These diseases cause HARM
- Please ADVISE & RECOMMEND
- IF NOT ASK PHU FOR HELP*

Influenza in the elderly

- Influenza infection increased demands on body
  - Fever / increases in HR, BP, RR / Inflammation
- Influenza contributes to functional physical decline (1998)
- Influenza exacerbates CVS and respiratory disease
- Inflammatory release of cytokines
- Promotes thrombosis and disrupts atherosclerotic plaques

A vaccine for heart attacks??

- Smoking Cessation – 32-43%
- Statins – 19-30%
- Antihypertensive Therapy- 17-25%
- Influenza Vaccine 15-45%
- Patients at risk of heart disease are under-vaccinated

Elderly Vaccination

- VSPs are more likely to support elderly vaccination
  - 98.8 % vs.66% hospital health care workers (P<0.0001)*
- HHCW (38.6%) are significantly less likely than GPs (89%) to know how to access to information regarding vaccination (P<0.0001)
- Doctor-recommendation predicts vaccination, even in people with negative perceptions of vaccination
- Pneumococcal (>65)
- Influenza Vaccination (>65)*
  - Indigenous – 6 mths -5 yr / 15 >
- Herpes Zoster (>70)
Waning Immunity

- ‘Weak Immune System’
- Decline in immune function (immunosenescence).
- >50 years
- Older individuals have fewer naive B and T cells, more memory cells
- Immune system requires a stronger stimulus
- Immunosenescence is now considered to be one characteristic of the normal aging process

Message

- Influenza and infections can cause serious illness in the elderly
- Under-vaccination rates
- Vaccines more effective in the elderly than many accepted public health interventions
- Health practitioner recommendation is key
- Largest growing area of health need

Vaccination in the elderly: an immunological perspective

Wilbur K. Chen, M.D., M.S.1, Bernard F. Kapikian, M.D., M.S.1, Rha B. Effros, Ph.D.1
Beatrice Grubert-Leibenzon, M.D.2, Robert Edelman, M.D.2, and Marcelo B. Satin, M.D.1

Varicella Zoster Virus

- Varicella Zoster Virus (VZV)
- Chicken Pox (Varicella)
- Shingles (Herpes Zoster- HZ)
- Airborne / Droplet – INFECTIOUS
- 2 weeks to symptoms - 48hr prior to rash- lesions crusted
- Infection at dermal- epidermal junction \(\rightarrow\) characteristic vesicular lesions.
- Sensory axons are located here as well \(\rightarrow\) Latency
- LIVE Varicella Vaccine
- LIVE Herpes Zoster Vaccine

Shingles

- Reactivation of VZV (latency \(\rightarrow\) shingles)
- Mechanism of latency is not fully understood
- Related to VZV antibody & T cell-mediated immune responses (VZV-CMI)
- Older people \(\rightarrow\) have high levels of VZV-specific antibody
- Shingles \(\rightarrow\) decrease of VZV-CMI activity.
- Age-specific incidence and severity of HZ
- Immunocompromised patients

Complications

- Complications of HZ occur in approximately
  - 8% - 50 to 59 years old
  - 12% - > 70 years old
- Post – Herpetic Neuralgia
- PHN ranging from 7% to 25% of HZ cases
- Persistence of significant pain for months after onset of the rash \(\rightarrow\) LIFE CHANGING
- Strongly influenced by the age of the patient.
- Difficult to manage \(\rightarrow\) chronic pain specialist

IS THIS REALLY GOOD FOR ME???
Herpes Zoster Vaccination

- "As with any infection, prevention is preferable to treatment"
- Prevent reactivation ➔ Boost VZV-specific immunity
  - Immune person is exposed to someone with VZV ➔ boosting
  - Clinical Trials with a live VZV vaccine (1984-1999)
    - 76,000 vaccinated persons >60 years ➔ 55% reduction in HZ
    - Reduced the number of complications
  - Indicated in > 60 years
  - Funded in >70 years
  - Contraindications:
    - Immunosuppressed
    - Pregnant
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  - UK Guidelines
    - The decision to administer Zostavax® to immunosuppressed individuals should be based on a clinical risk assessment.
    - Specialist care: vaccination should not proceed until the advice of the specialist or a local immunologist has been sought.
    - Has primary or acquired immunodeficiency states...
      - acute and chronic leukaemias, lymphoma
    - Is on immunosuppressive or immunomodulating therapy including:
      - those who are receiving or have received in the past 6 months immunosuppressive chemotherapy or radiotherapy for malignant disease or non-malignant disorders
  - CDC Guidelines
    - Zoster vaccine should not be administered to persons with primary or acquired immunodeficiency.
    - Leukemia, lymphomas, or other malignant neoplasms affecting the bone marrow or lymphatic system.
    - The package insert implies that zoster vaccine should not be administered to anyone who has ever had leukemia or lymphoma.
    - Advisory Committee on Immunization Practices recommends that persons whose leukemia or lymphoma is in remission and who have not received chemotherapy or radiation for at least 3 months can be vaccinated.
  - Australian Guidelines
    - Live attenuated zoster vaccine is contraindicated in persons with severe immunocompromise due to either a primary or acquired medical condition, or due to medical treatment.
    - Persons suffering from malignant conditions of the reticuloendothelial system (such as lymphoma, leukaemia, Hodgkin’s disease)
**Key points**
- Sunshine Coast – 2-10 errors
- The lack of knowledge about the effectiveness / SAFETY of a second dose of vaccine.
- Strong likelihood dose 1 and 2 at the same practice.
- Careful history and check Australian Immunisation Record
- The decision to administer Zostavax® to immunosuppressed individuals should be based on a clinical risk assessment.
- The burden of shingles disease within the age group (which increases with age).
- The estimated effectiveness of the vaccine within this age group (which decreases with age).
- The package insert implies that zoster vaccine should not be administered to anyone who has ever had leukemia or lymphoma.
- If in doubt seek specialist advice.

**OVERALL**
- Pregnant women / Babies– at risk
  - Influenza & Pertussis
  - Elderly – at risk
  - Infection / influenza /pneumococcal → heart attack
  - Herpes Zoster – Concern of Live vaccines
  - Still see errors locally!
  - Vaccines are safe if used appropriately
  - Health Care providers have a KEY role in EDUCATION and RECOMMENDATION

**Other Issues**
- Health Pathways
  - Influenza Vaccination
  - Shingles (Herpes Zoster)
- Meningococcal Disease
- Communication with Public Health
  - Exploring Secure Communications via GP practice software
  - Vaccine Hesitancy Service
  - KISS - Kommunity Immunisation specialist service
- Further talks – Sunshine Coast Public Health Unit & PHN
  - Travel Health
  - Vaccine Hesitancy

**Thank you**