Microbiology Sheet #9
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**Paramyxoviruses**

 There are 6 subtypes of paramyxoviruses that produce infections, not only associated with the respiratory tract, but may cause further complications and clinical features.
 Parainfluenza virus and mumps virus are very similar in structure in terms of glycoproteins present on their surface (Hemagglutinin and neuramidase on the same spike).
 -Also have F-proteins that are important to attach to upper respiratory tract to produce infection.(results in fusion between the virus and receptors in the upper respiratory tract) .
 New castle disease virus, is similar in structure to parainfluenza and mumps, yet its associated with **poultry respiratory disease** (chicken and birds), rarely reaches humans through birds. It's usually common in farm birds, and causes loss of huge number of birds, therefore, a vaccine was made to prevent the death of farm birds. Yet, in comparison to parainfluenza, there is **no vaccine** found in the market.

**1- Parainfluenza Viruses**

 Its not a true influenza virus, yet similar to it, since it produces upper respiratory tract infection which might descend to the lower respiratory tract, and produces very similar clinical features to influenza virus
-The only difference is that it's not as serious as influenza virus, it's not associated with complications like pneumonia.
-Its mostly related with upper respiratory tract, causing runny nose, fever and conjunctivitis.
-bronchitis and pneumonia are complications rarely produced
 \* Its divided into 4 serotypes according to its **antigenic structure.**
-Type 1 and type 3 are the most common, and type 3 is more common than type 1, and can occur throughout the year.

- Incubation period is more than influenza virus**, about 1-7 days**
- route of infection is via respiratory tract droplets (similar to influenza)

-In influenza virus, Immune response stays between 6-12 months, while **in parainfluenza virus, the rate of recurrence is higher.**-this virus cannot enhance solid immunity (strong response), and a person might develop re-infection with same serotype within few months.

**2- Mumps Virus**

 The infection usually occurs between winter and spring and starts like the other respiratory tract infections. Its only related to human hosts.

-There are two stages of infection

-Incubation period of mumps is longer than influenza and parainfluenza **(2-3 weeks).**-In the first few days of infection, 10-20% of infected population (mainly children) represent non-specific signs and symptoms related to respiratory tract -Flu-like manifestations- (fever, sore throat, runny nose, pharyngitis..etc)
 but later it reaches the blood stream (viremia) and produces special clinical manifestations like infection and swelling of the parotid glands (parotitis) due to blockages of the gland’s ducts.

\*Further complications may occur specially in **immunocompromised children** or **children with malnutrition**, like:
- pneumonia and bronchitis,
-also more serious: aseptic meningitis and encephalitis (less)
- may affect the 8th cranial nerve and produce deafness

-Rarely it is associated with complications in healthy children

\* mortality rate is high (higher than other respiratory tract viruses).
In low economic countries like Africa, mortality rate of children infected with mumps may reach 15%.

\*Infection with mumps between 1 and 12 years in healthy children isn't associated with complications, yet after puberty, infection with mumps will result in orchitis in males (inflammation of testis) and oopheritis in females (inflammation of ovaries), and rarely may lead to sterility.

*\*Prevention*
The best method to prevent complications that occur during adulthood is **vaccination during childhood.**
\*Vaccination of mumps occurs in association with other 2 viruses
( Measles, Mumps, and Rubella/Robuola) = **MMR**
\*\* Robuola isn't the same as rubella, it's a small type of measles

-The vaccine is started in each country/continent according to its climate.
For example, in our countries its given to children between 9-12 month old, and its the most efficient because you cant give it to children younger than 6 months since the baby wont develop sufficient immune response, and also waiting after 1 year may be late and the child might suffer from the infection before getting vaccinated.

-In U.S and Canada its started after 1 year old.

\*\*One shot of the vaccine isn't enough to produce a solid immune response specially against rubella, two shots are needed (the second shot at between 4-5 years of age).

**3- Measles/ Robuola**

 \*structure: it has hemagglutinin without neuramidase, instead it has another structure called hemolysin. F-proteins are also found.

\*Route of infection is exactly the same as other respiratory tract infections: respiratory droplets. Yet there's a misconception that infection occurs through skin contact (due to rash) , which is not true. **Because the skin rash contains the antigen of the virus not the living virus, therefore its not a source of infection.**

\* The infection starts in the respiratory tract by multiplying in its mucosa, then the virus reaches the blood stream and produces *primary viremia* ( reaching the reticulo-endothelial system and the lymph nodes), then returns back to respiratory tract, and produces *secondary viremia* leading to skin rashes and high fever.

\*so its associated with 2 stages:
 the first: in the respiratory tract
the second: associated with primary and secondary viremia and **in secondary stage of viremia skin rashes occur.**

\*Complications:
During the first stage of the disease that’s related to the respiratory tract, the child might suffer from:
- bronchitis and pneumonia
-gastro-intestinal signs and symptoms
-*stomatitis* (koplick spots – small irregular, red spots with white center on the buccal mucosa near molar teeth)
-severe enteritis
-Encephlitis (more).. Aseptic meningitis (less)
-corneal ulcerations and blindness (mainly in severely immunocompromised and malnutrition children)
-Multiple sclerosis may occur after many years of infection with mumps

**It was found that these complications are mainly associated with children with Vit A & D deficiency, especially in developing countries.**

\*Mortality is also high as mumps, it might reach upto 15% (dangerous viruses)

\*Recovery occurs within the 1st week by the child’s natural immunity, which prevents the re-infection with the virus. And natural immunity is much stronger than the immunity induced by the vaccine, yet, the vaccine reduces the complications associated with measles and mumps virus.

\*Vaccine:
There are different types of vaccines, each country has different preferations.
-There's the MMR vaccine (Jordan only has MMR)
-also there are vaccines only for mumps and measles without rubella (preferred in U.S)
..etc

-The triple MMR vaccine shouldn't be given to adults, due to production of severe side effects. In emergency cases, example pregnancy, where rubella vaccination is necessary, it's given alone (single) and not combined with the other 2 vaccines.

**4-Human respiratory syncytial viruses (RSV)**

 It's not a single virus, its composed of different serotypes, and it is similar to another virus known as Human Metopneumovirus.
-They are similar in structure in presence of hemagglutinin antigens and F-protein on the same spike, but they have different clinical features.

\* Infection starts in the respiratory tract like other respiratory tract viruses, rarely reaches blood.
It might complicate to bronchitis specially in infants between 6 weeks to 2 years**.
\*\***Note that the other viruses ( parainfluenza, measles, mumps..) don't develop infection in infants this young.

-then why does RSV produce an infection in infants below 6 months of age?
Because usually maternal antibodies provide natural immunity for the baby till the age of 6 months including immunity from mumps, parainfluenza, and measles. But there's **no natural immunity provided against RSV**, since their antibodies are not transferred to the infant.

\*children older than 2 years old produce only mild clinical manifestations and can accommodate with the infection more than adults which produce more severe manifestations and might also produce asthma after the infection with RSV.
-Also the infection in immunocompromised people is severe and might lead to mortality.

\*syncitial means elongation of cells, and produce large cells specially during lung infection, leading to damage of cells of the RT.

\* RSV infections are not found as single cases, they usually spread as an outbreak especially in crowded places like nurseries.

\*\*Controlling outbreaks of this virus is difficult because:
**- it can survive in the environment
-somehow resistant to cold temperatures and some disinfectants
-only a few number of viruses cause infection**

Therefore to control this virus we must use strict hospital control measurements (nurse must wash her hands between patients, and must not take care of two children at the same time..etc)

\*The infection is mild but it might be associated with gastrointestinal symptoms (diarhea), yet it might cause highly fatal infections in immunocompromised.

*\*No vaccine is present*

**5- Human Metapneumoviruses (HMPV)**

 They are related to some extent to RSV.

 There are different types of pneumoviruses other than Human metapneumoviruses that infect animals and rarely infect humans.

\*Pneumoviruses are RNA viruses that mutate rapidly.
for example: in the last 10 years a new virus was formed due to RNA mutation, which lead to large number of cases of bronchitis and pneumonia in children and in adults, and some of the cases were fatal.

#As the research in our country found, High percentage of children when they reach the age of 2 years, would have already been infected with HMPV, and already have developed immunity against it.
And this is good because it would prevent infection in adulthood which would lead to more severe complications.

\**No vaccine is present*, medications such as anti-virals and others shouldn't be given, since the supportive therapy is enough (fluids, painkillers..etc).
Except in cases were secondary bacterial infections occur, we give antibiotics.

GOOD LUCK ^\_^