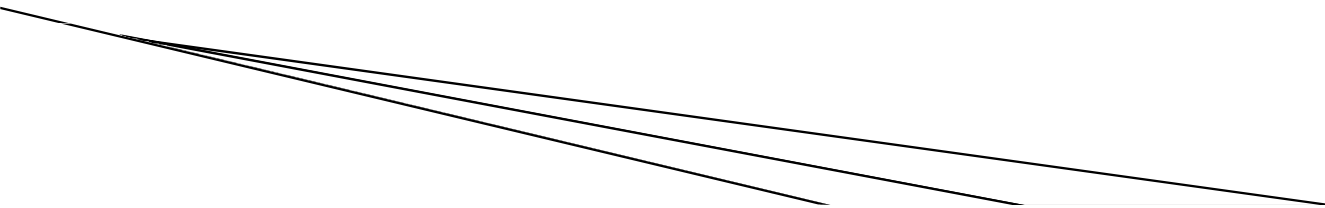


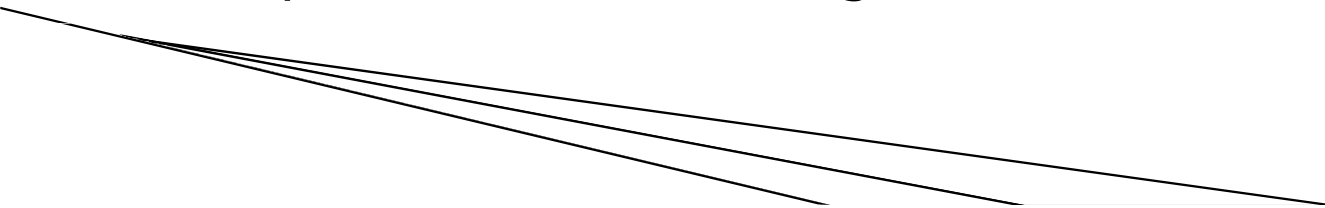
Epidemiology of Respiratory Tract Infections

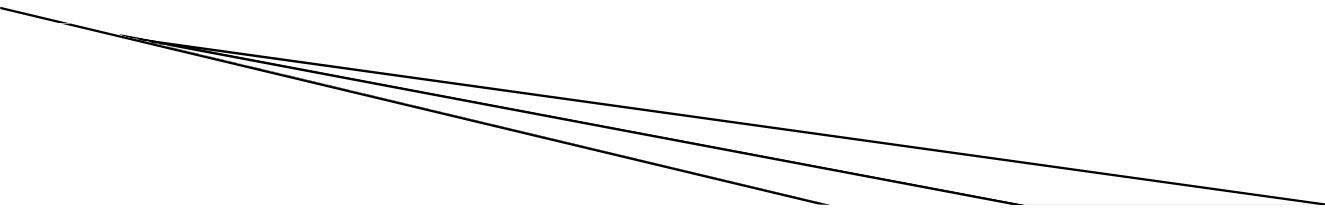
Dr. N K Goel

*Professor & Head, Department of
Community Medicine
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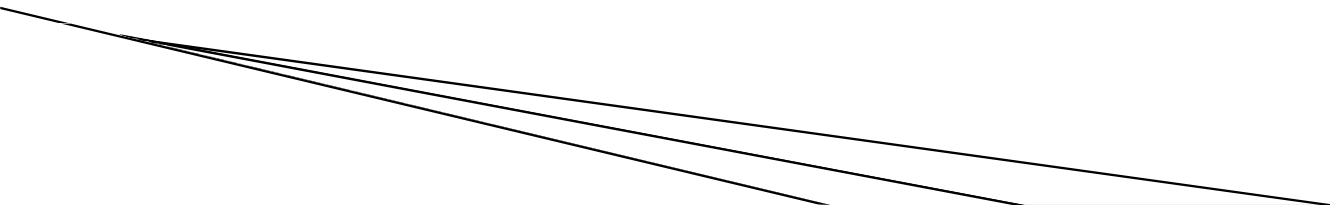


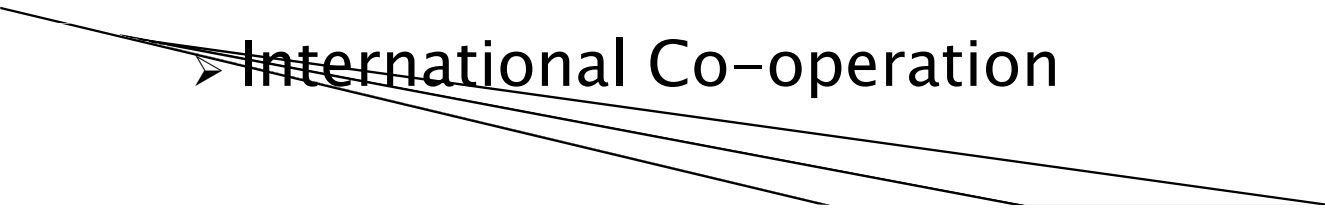
Smallpox

- ▶ An acute contagious disease caused by variola virus
 - ▶ The only disease to have been eradicated by medical science globally.
 - The last known naturally occurring case of smallpox occurred in Somalia on 26 Oct 1977.
 - Subsequently, two cases due to *accidental laboratory infections* were reported from England in 1978.
 - A little over two year later smallpox officially was declared eradicated by the World Health Organization in 1980.
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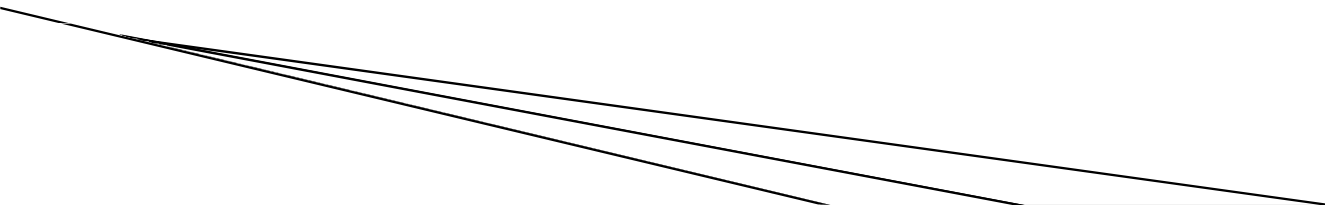
- ▶ In 1976, there were 76 laboratories through out the world that officially kept stocks of Smallpox virus.
 - ▶ By 1980, the number was reduced to six laboratories.
 - In 1983, the number was down to *two WHO collaborating centers*.
 - The US Laboratory in *Atlanta, Georgia,(USA)* and
 - The Research Centre of Virology, *Koltsovo, Russia*.
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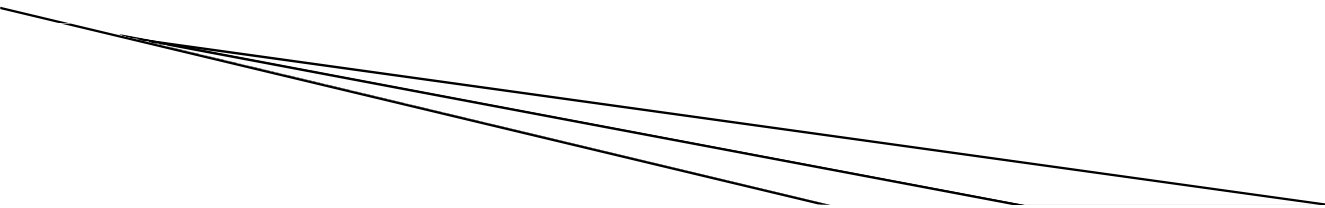
- ▶ The *two strategies* used for the eradication of
 - *Mass vaccination and*
 - *Surveillance containment of the disease.*



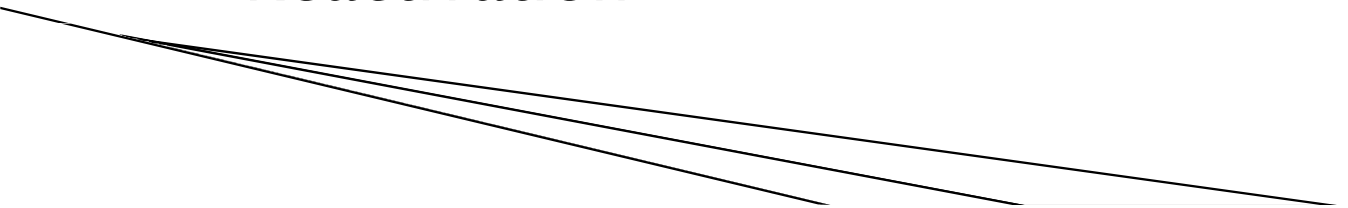
- ▶ *Eradication was also facilitated by Following epidemiological features of smallpox:*
 - *No known animal reservoir.*
 - *No long – term carriers*
 - Recovery from infection provides *Stable life long immunity.*
 - *Detection of cases* of smallpox was *relatively simple*
 - the rash was so characteristic and occurred on the visible parts of the body.
 - *An extremely effective and stable vaccine* which provided long term immunity.
 - Surveillance & Containment
 - International Co-operation
- 

Is Smallpox a Threat Today?

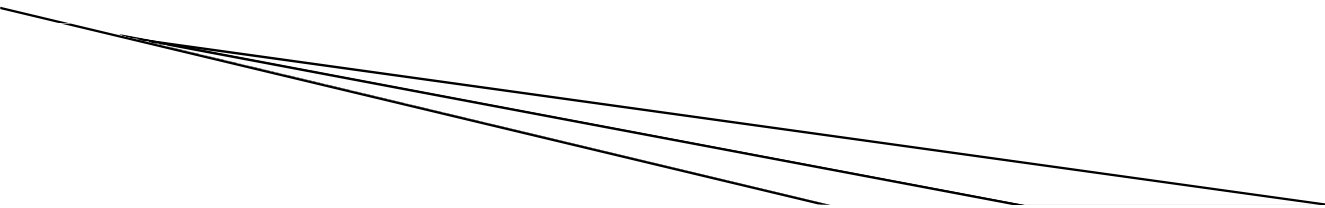
- ▶ In 1979, WHO recommended that vaccination against smallpox be stopped in all countries.
 - ▶ By 1986, routine vaccination had ceased in all countries.
 - ▶ The eradication of smallpox was defined by successive WHO expert groups as “*the elimination of clinical illness caused by variola virus*”.
 - ▶ An important corollary of this definition was that *it did not involve the extinction of variola virus*.
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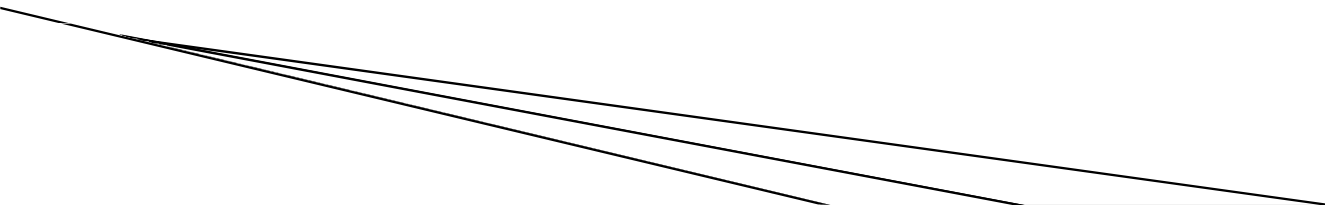
- ▶ However, there have been no cases of smallpox from any source for over *thirty eight years*.
 - ▶ Fears of conversion of animal viruses like monkeypox to the smallpox virus have been discounted.
 - ▶ Currently, the only credible sources of the virus are the stocks held in the two WHO Collaborating Centres in the United States and Russia.
 - ▶ Therefore, other than the *use of the virus as a biological weapon, there appears to be little reason to fear the return of smallpox.*
- 

Chicken Pox

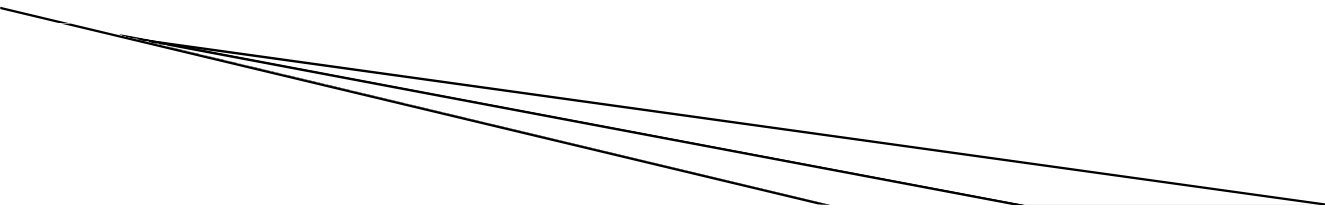
- ▶ An acute, highly contagious which occurs mostly in
 - ▶ Worldwide distribution –Globally 4.2 m complications & 4200 deaths
 - ▶ India–30,000 cases &70 deaths CFR–
 - ▶ It results from primary infection by the *Varicella zoster* virus.
 - The virus is *capable of remaining latent* in the neural ganglia.
 - *Reactivation* of the latent virus causes *Herpes zoster*.
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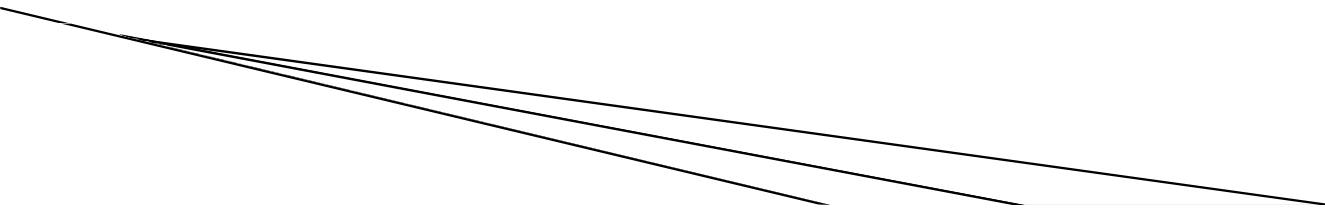
Epidemiology

- ▶ *World wide.*
 - ▶ In *temperate countries* more than 95% of adults have antibodies against the virus.
 - ▶ *Childhood infection rates are somewhat lower in tropical countries but adult infection rates are higher.*
 - ▶ Chickenpox occurs in both *endemic and epidemic forms* in India.
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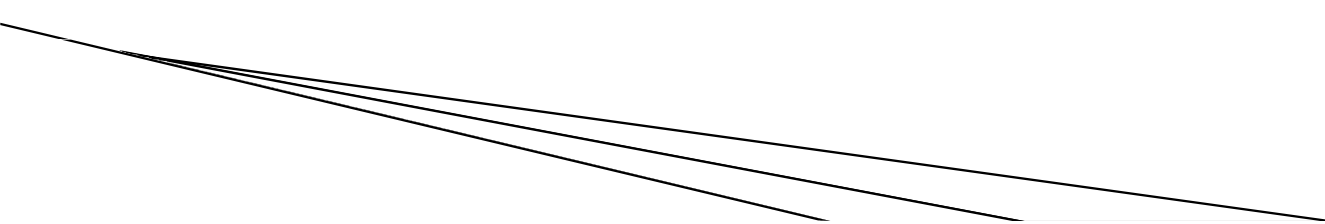
- ▶ The *Varicella zoster* virus is virus of the Herpesviridae family.
 - ▶ Humans are the *only known hosts* of the virus.
 - ▶ It is primarily a disease of childhood particularly in temperate countries where 90% of cases occur before 13 years of age.
 - ▶ *In tropical countries, it is more a disease of young adults.*
 - ▶ The virus exhibits no gender or ethnic group predilection.
 - ▶ *Natural infection confers lifelong immunity.*
- 

- ▶ The virus can remain *latent in sensory root ganglia*.
- ▶ *Any reduction in cell mediated immunity can result in reactivation of the virus which causes Herpes zoster.* The disease occurs with greater severity among *adults, newborn infants, immunocompromised children and pregnant women.*
- ▶ Mortality rates in normal young children are estimated to be less than *02 per 100,000*. Mortality risk for adults is 15 times higher.

- ▶ The source of infection is almost always a case of chickenpox as subclinical cases are rare (less than 5%).
 - ▶ Transmission is through *direct contact or air borne spread* of infected droplets or droplet nuclei.
 - ▶ The vesicle fluid is infective.
 - ▶ The portal of entry for the virus– the upper respiratory tract.
 - ▶ Patients are *infective from one to two days before onset of rash to five days after first appearance of rash.*
 - ▶ Dry scabs are not infective.
- 

- ▶ Extremely contagious.
 - ▶ *Secondary attack rates are typically over 90%* among susceptible household contacts.
 - ▶ The virus can *cross the placental barrier*.
 - ▶ Maternal infection in first trimester can give rise to *congenital varicella syndrome*.
 - ▶ Maternal infection just prior to delivery may result in *neonatal varicella which carries high mortality*.
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- ▶ Incubation period –01–03 week(usually 13 to 17) days.
- ▶ Period of communicability: 1–2 days before appearance of rashes to 4–5 days thereafter.



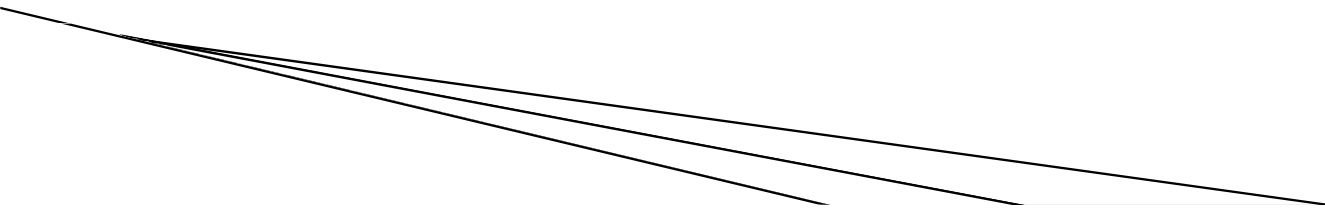
Prevention & Control

- ▶ *Varicella Zoster IG* given within 72 hours of exposure–
im12.5units/kg B Wt(max.625units), Repeat dose in 03 weeks
- ▶ *Live attenuated Vaccine– Monovalent –02 doses (>_13 years)*
MMRV –02 doses (09 mon–12 years)

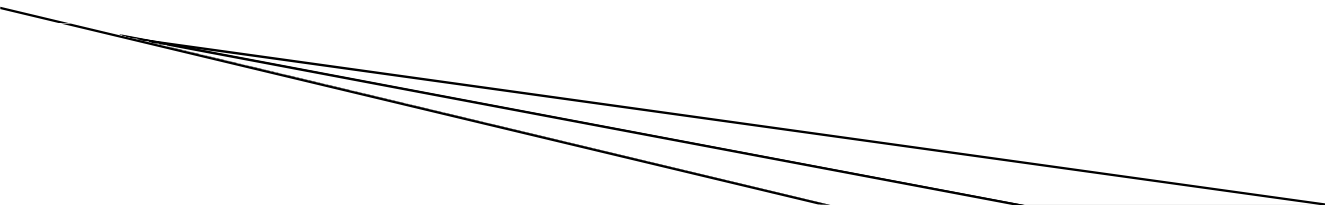
C. I.– Pregnant & Immunocompromised

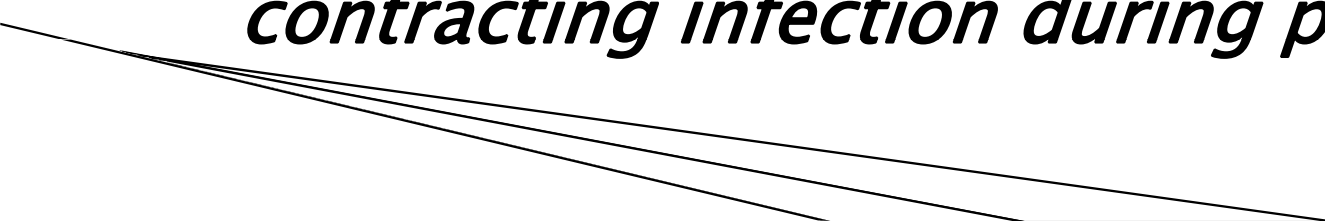
- ▶ Notifications
 - ▶ Isolation of cases
 - ▶ *Disinfection of articles*
 - ▶ Antiviral drugs e.g. *Acyclovir for contacts.*
- 

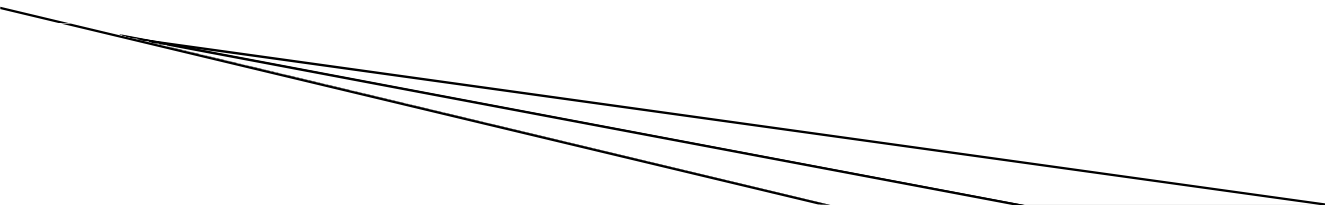
Rubella

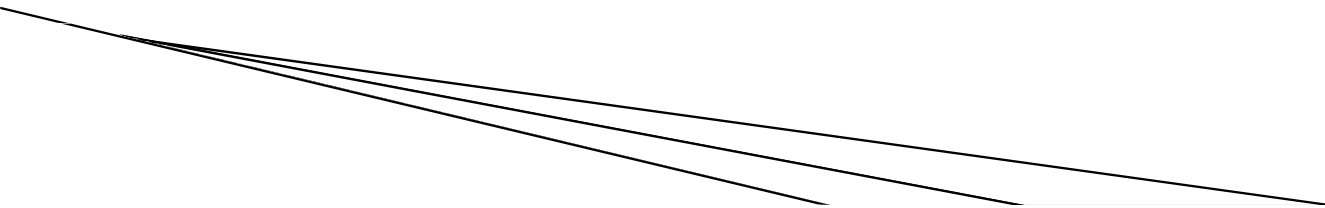
- ▶ *German measles* or “*03 day measles*”
 - ▶ A mild childhood disease.
 - ▶ However, *infection during early pregnancy* may cause *feotal death or the congenital rubella syndrome(CRS)*.
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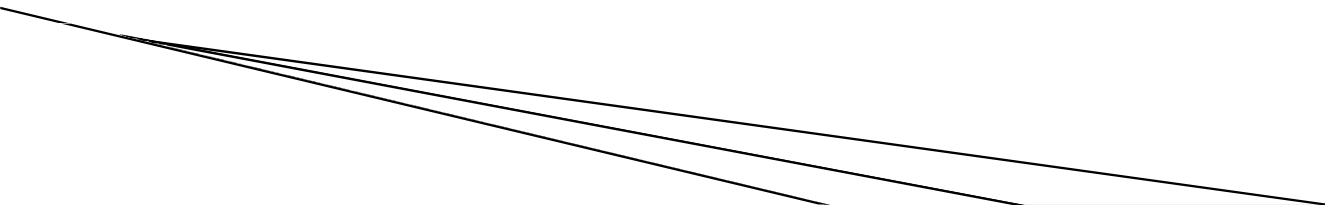
Epidemiology

- ▶ Before the advent of widespread vaccination in developed countries *epidemics of rubella* occurred *every 6 – 9 years* and *large scale epidemics at intervals of 30 years*.
 - ▶ The World Health Organization (WHO) estimates that more than *1,00,000 cases of congenital rubella syndrome(2016)* occur each year in developing countries alone.
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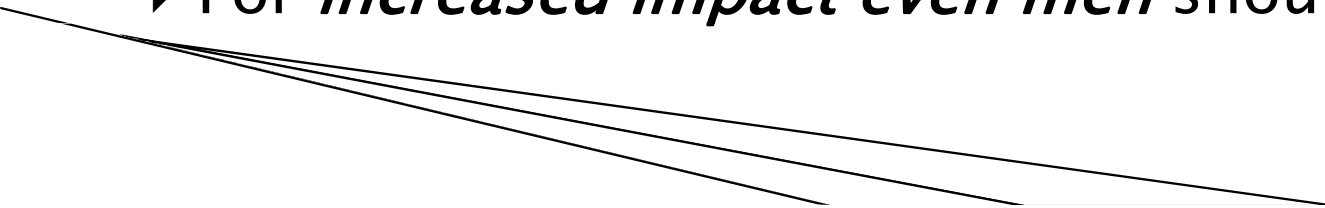
- ▶ Before the introduction of rubella vaccine the incidence of congenital rubella syndrome varied from *0.1 – 0.2 per 1,000 live births*.
 - ▶ In India, *appr. 10–15% women* reached childbearing age without developing immunity against rubella virus and were *at high risk of contracting infection during pregnancy*.
- 

- ▶ RNA virus–genus *Rubivirus* from the *family Togaviridae*.
 - ▶ Humans are the *only known reservoir*.
 - ▶ In the pre – vaccine era, the peak age of incidence was in the 5 – 9 years age group.
 - ▶ With *widespread childhood vaccination* in the developed countries, the frequency of rubella has increased in the older age groups.
- 

- ▶ The disease exhibits a seasonal pattern.
 - ▶ In temperate countries seasonal peaks of the disease are seen in *late winter and spring*, though infection remains endemic through the year.
 - ▶ Rubella virus is transmitted by the respiratory route.
 - ▶ Sub – clinical cases are important factors in disease transmission.
- 

- ▶ Cases are infective from 10 days before to 15 days after onset of rashes.
 - ▶ Incubation period – 12 – 23 days, (av – 18 days).
 - ▶ ***Congenital Rubella Syndrome*** (CRS):
 - Triad of *deafness, cardiac defect and cataract*.
 - The risk of congenital defects gradually drops from as high as 65 – 85% in the first two months of pregnancy, to 30 – 35% in the third month, to 10% in the fourth month.
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Prevention & Control

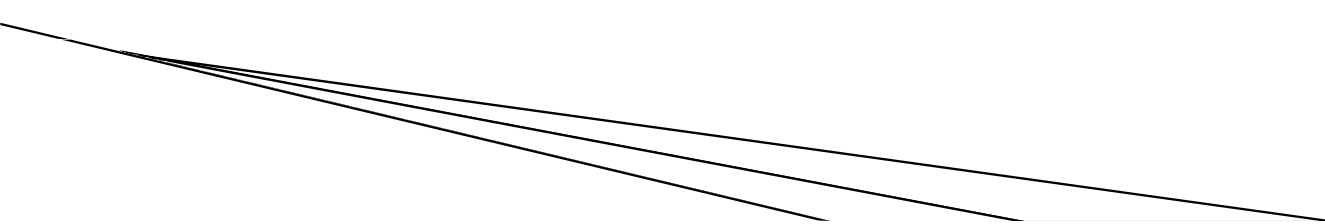
- ▶ Live attenuated vaccine (RA 27/3 strain) as single or combined (MMR)–0.5ml sc.
 - ▶ The Rubella vaccine should **not** be administered to pregnant women and *pregnancy should be avoided* for three months after vaccination.
 - ▶ WHO recommends that countries wishing *to prevent CRS should immunize adolescent girls and/ or women of childbearing age.*
 - ▶ The most rapid impact would be achieved by *mass campaigns for women of childbearing age (and men preferably).*
 - ▶ For *increased impact even men* should be vaccinated.
- 

Mumps

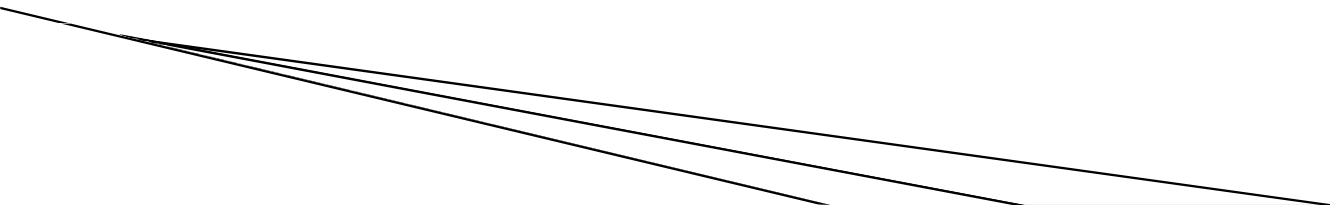
- ▶ The name comes from the British word “*to mump*”, that is *grimace or grin*.
- ▶ This results from the appearance of the patient as a result of *parotid gland swelling*.
- ▶ A viral infection primarily affecting the *salivary glands*.
- ▶ In most instances mumps is *a mild childhood disease*.
- ▶ Mumps virus may also affect adults, among whom complications such as meningitis and orchitis are relatively common.
 - Encephalitis and permanent neurological sequelae are *rare*

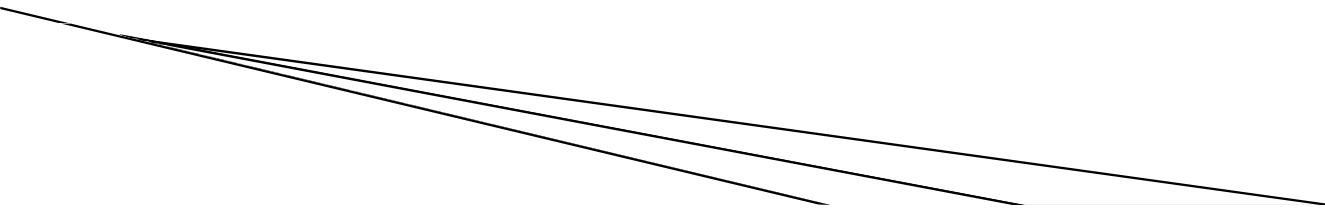
Epidemiology

- *Endemic* worldwide.
- Currently, in most parts of the world, the *annual incidence of mumps – 100 to 1000 per 100,000 population.*
- In areas without childhood vaccination against mumps, *epidemics occur every 02–05 years*

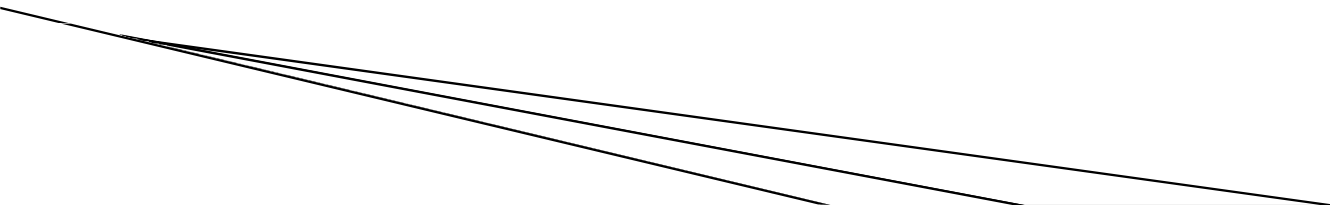


- Genus rubulavirus of the *paramyxoviridae* family.
- Humans – *only natural hosts*.
- *Peak incidence* – children 05–09 years .
- *In hot climates the disease is endemic throughout the year,*
whereas in temperate climates incidence peaks in winter
and spring.



- ▶ The virus is *spread via airborne droplets* from the upper respiratory tract or by direct contact.
 - ▶ *Requires more intimate contact* for transmission than measles or chicken pox.
 - ▶ Rarely, transmission can be fomite borne through articles freshly contaminated with saliva.
 - ▶ *Overcrowding* resulting in close contact such as school classrooms, cinema halls, army barracks facilitates transmission.
- 
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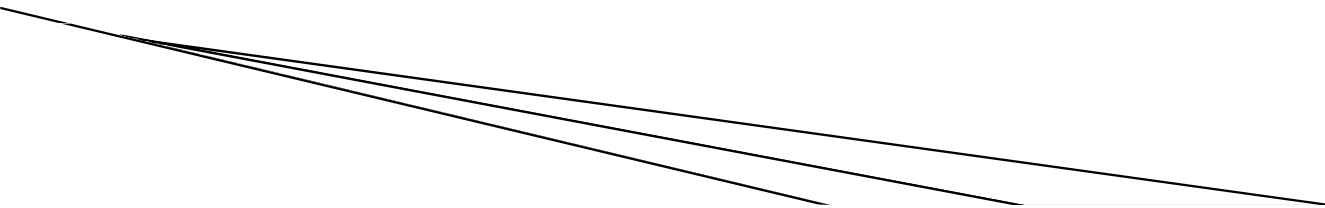
- ▶ Persons with mumps are infective from about 2 days before the onset of swelling of the salivary glands up to 9 days after the onset of swelling.
- ▶ Incubation period–16–18 days(range of 2 to 4 weeks).



Prevention & Control

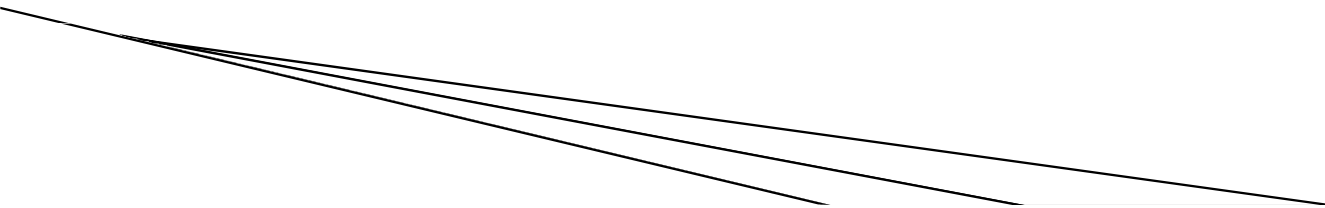
- ▶ Live attenuated mumps virus vaccines based on several different strains.
 - The common ones are the Jeryl – Lynn strains, RIT 4385 strains, Leningrad – 3 strains, L – Zagreb strains, Urabe strains & the Rubini strains.
- ▶ In India, the MMR vaccine is manufactured by the Serum Institute of India.
 - The strains used are L – Zagreb for mumps, Edmonston Zagreb for measles and Plotkins RA 27/3 for rubella.
- ▶ The mumps vaccine should ***not be administered to pregnant women and pregnancy*** should be avoided for three months after vaccination.

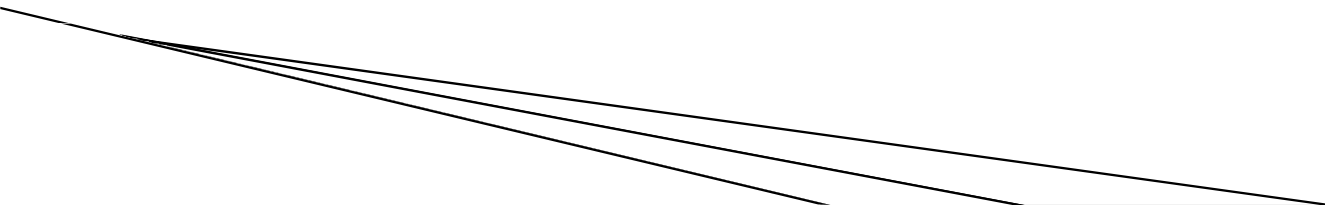
Measles

- ▶ ‘Rubeola’ means red spots.
 - ▶ Measles, an acute *viral exanthematous fever* is a leading cause of childhood deaths in developing countries.
 - ▶ Measles is one of the *most contagious diseases* known.
 - ▶ Almost all non – immune children contract this respiratory disease if exposed to the virus.
 - ▶ It is *a human disease* not known to occur in animals.
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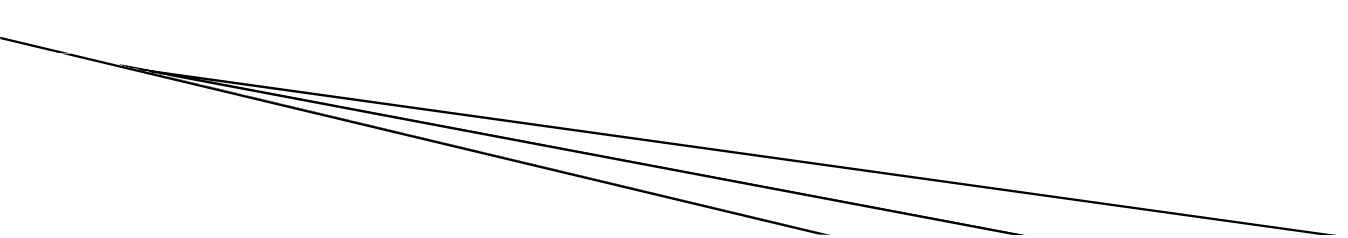
Epidemiology

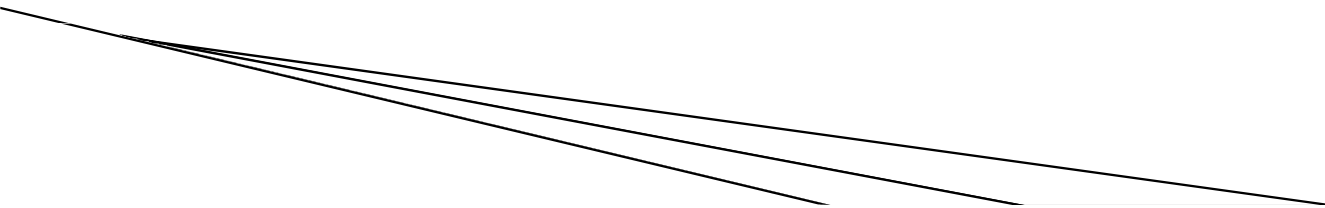
- ▶ 865–925 AD : Earliest description given by Arab
- ▶ 1846: **Panum** did classical study on measles
- ▶ 1954: *Enders et al isolated measles virus.*
- ▶ 1958: Measles vaccine first clinical trial.
- ▶ 1963: Live measles vaccine was licensed for use.

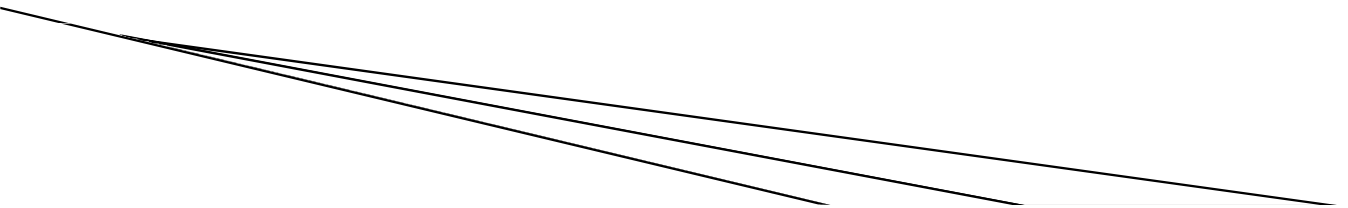


- ▶ It has been responsible for *millions of deaths* since its emergence over five thousand years ago.
 - ▶ Measles is *reported from all countries* without exception.
 - ▶ Prior to the introduction of a safe and effective vaccine measles epidemics would occur every two to five years resulting in an estimated *five to eight million deaths every year*.
 - ▶ The introduction and widespread use of the vaccine has brought about *a marked decline in measles occurrence and mortality*.
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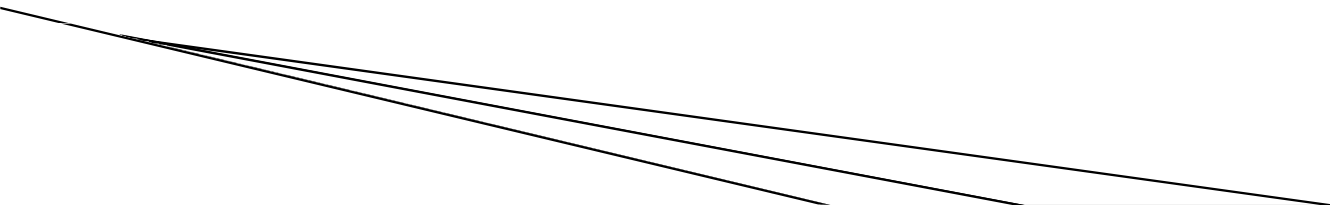
- ▶ Even though routine immunization coverage in the Region increased from 61% in 2000 to 90% in 2014, the Region as a whole achieved a modest 64% reduction in the estimated measles deaths during that period.
- ▶ Case – fatality rates in these countries are normally in the range 1 to 5% but may reach as high as 10 to 30% in populations with *high levels of malnutrition and poor access to health care*



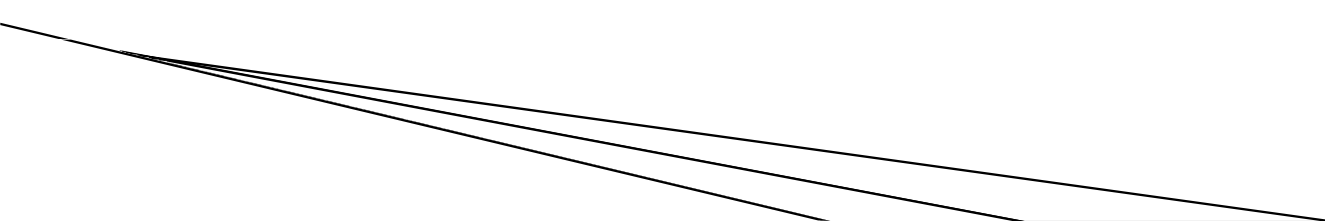
- Genus *Morbillivirus* –family paramyxoviridae.
 - Humans are the ***only natural hosts*** for the virus.
 - Susceptibility to infection is universal in those not exposed irrespective of age.
 - Most infections occur in the age group ***six months to three years*** in developing countries.
 - ***Immunity lasts lifelong*** after natural infection.
 - Nutritional status has an important bearing on the severity of disease. Measles is ***very severe in malnourished*** with higher mortality.
- 

- ▶ In India, the *peak incidence of measles* is in winter and early spring.
 - ▶ The mode of transmission is person to person *by direct contact*.
 - ▶ Transmission is *through droplets or airborne* spread of secretions from the respiratory tract of measles cases.
 - ▶ Articles freshly soiled by discharges are also infective.
 - ▶ *Overcrowding* favours transmission.
 - ▶ Secondary attack rates close to 90%.
- 

- ▶ **Period of communicability** is from one to two days before prodrome to four days after appearance of rash.
- ▶ **Incubation period** ranges from 8 to 13 days from exposure to fever and is usually 14 days from exposure to appearance of rash.



- ▶ The commonest complications of measles result from involvement of the *respiratory tract or the Central Nervous System (CNS)*.
- ▶ The most serious complications include *blindness, encephalitis, severe diarrhoea possibly leading to dehydration, ear infections including otitis media, and severe respiratory infections such as pneumonia*, which is the most common cause of death associated with measles.



Prevention & Control

- ▶ Measles vaccine–MR Campaigns–2012–2020
 - ▶ Passive immunization with Human Immunoglobulin (should be administered within 6 days of exposure).
 - ▶ Isolation of case.
 - ▶ Measles Elimination Strategy:
 - Catch-up
 - Keep-up
 - Follow-up
 - ▶ Surveillance
- 