Classification of viruses

Seven or eight schemes of classification for viruses have been produced in the past .

Till 1950 little was known about the viruses . Viruses may affect , animals , insects , plant and bacteria . Attempt was made to classify the viruses on the basis of their affinity to different system or organ of the body e.g. :

1- Those producing skin lesion (small pox , measles) .

2- Those affecting nervous system (polio , rabies) .

3- Respiratory tract involving viruses (influenza , common cold) .

4- Viruses causing visceral lesions (yellow fever , hepatitis) .

It was also suggested that viruses should be classified based on epidemiological criteria , some of the examples are as :

1- Enteric virus :

(a) Picorna virus .

(b) Adeno virus .

(c) Reo virus .

(d) Hepatitis virus .

2- Respiratory :

(a) Orthomyxo virus .

(b) Paromyxo virus .

(c) Corona virus .

(d) Rhino virus .

(e) Reo virus .

3- Arbo (arthropod born) :

(a) Toga virus .

(b) Bunya virus .

(c) Rhabdo virus .

(d) Orbo virus .

It is not out of place to enumerate **the criteria** that has been used in forming groups **of animal viruses** :

1- Type of nucleic acid .

2- Chemical composition .

3- Susceptibility to physical and chemical changes .

4- Size measurement .

5- Design and construction .

6- Antigenic characters .

Now a days viruses are classified into **two groups** depending **on type of nucleic acid** they possess ;

1- Ribovirus ; those containing RNA .

2- Deoxyribo viruses ; those containing DNA .

They may be further classified on the following characters :

(i) Strandedness of nucleic acid.

(ii) symmetry of nucleocapsid.

(iii) presence of envelope .

(iv) number of capsomers .

Further discussion is based on above mentioned characters .deoxyribose (***DNA***) viruses are at present placed in five groups and ribovirus (***RNA***) into nine groups .

A- Major groups of DNA viruses

(1) ***poxvirus*** . They are large brick shaped particle 230 to 300 nm x 200 to 250 nm,visible by light microscope they may cause small pox , vaccinia , mollusucum contagiosum ,cow pox and milker nodes . Examples are variola , vaccinia , molluscum contagioum , avian pox etc.

(2)***Herpes*** .They are enveloped and icosaherdral . They multiply within nucleus . They are covered by ether sensitive envelope . They may cause vesicular skin lesions , encephalitis , chicken pox etc . examples are herpes simplex virus varicella zoster virus , cytomegalovirus etc.

(3) ***Adeno virus***. They multiply in nucleus .They are ether resistant . They may cause latent infection of lymphoid tissue , herpes virus , adeno virus etc.

(4) ***Papova virus***. They are icosahedral , multiply in nucleus and ether stable .They may cause human warts papillomata (**PA**) of rabbits , dogs etc , polyoma (***po***) in mice vacuolating agents (***VA***) SV40 . All are potentially oncogenic . Examples are papilloma virus , polyoma virus , SV40 etc.

(5) ***Parvo virus***. They are very small 18 to 22 nm in diameter and are ether resistant e.g. minute virus of mice ,and adeno satellite virus .

B-Major groups of RNA viruses :

1-Orthomyxoviruses .They are spherical or filamentous , enveloped with lipoprotein studded with neuraminidase and haemagglutinin subunits . e.g. influenza viruses A ,B and C .

2-Paramyxoviruses.They are similar myxovirus but are larger and more pleomorphic. They may cause respiratory infections , bad cold , measles , mumps etc Examples are parainfluenza virus , Newcastle virus etc .

3-Rhabdovirus . They are large enveloped , bullet shaped and ether sensitive . they may cause rabies in mammals and vesicular stomatitis in cattles etc . Examples are rabies virus vesicular stomatitis virus etc .

4-Togavirus . They are icosahedral enveloped by lipid. They require arthropod vectors and may cause meningoencephalitis , lymphadenopathy , bleeding and purpuric rashes , yellow fever etc . Examples are yellow fever and dengue viruses .

5- Arenavirus . They are enveloped and ether sensitive causing benign meningitis and encephalitis e.g. lymphocytic choriomeningitis virus etc .

6- Reovirus . They are ether resistant , naked icosaherdral with double stranded **RNA** causing mild respiratory and enteric diseases.

7-Picornavirus. They are small icosahedral , ether and acid resistant causing neuronal damage with paralysis (Polio-1 and -3) , aseptic meningitis etc .***e.g***. polio virus , ECHO virus , coxsackie virus, rhino virus etc .

8-Leukovirus .They induce malignant transformation of calls with formation of new antigens and enzymes with loss of contact inhibition e.g. leukaemia , sarcoma in fowls and mice e.g. roussarcoma , murine leukaemia , murine mammary tumour virus etc.

9-*Coronavirus* . They are elliptical or spherical and ether sensitive causing cold and acute respiratory infection , mouse hepatitis etc . examples are human , murine and avion virus .

Oncogenic Viruses

Viruses that produce tumors in their natural hosts or in experimental animals or induce malignant transformation of cells on culture are known as oncogenic viruses .They may be DNA viruses or RNA viruses .

A. Oncogenic DNA Viruses :

1- Papova Viridae : warts in man and animal .

a- Polyoma virus . b- Simian virus 40 (SV 40) .

2- Adenoviridae : Adenovirus type 12 produced sarcoma .

3- Herpetoviridae :

a-Epstein – Barr Virus . b- Herpes Simplex Type -2

B. Oncogenic RNA Viruses :

1-Avian leukosis viruses .

2- Murine leukaemia and sarcoma viruses .

3- Mammary tumer viruses of mice .

Mechanism of Viral Oncogenesis :

The following hypothesis are suggested :

1-Provirus Hypothesis ; after infection genome of RNA tumor virus is converted into RND - DNA hybrid by the enzyme reverse transcriptase present in the virus . This RNA-DNA hybrid produce provirus (DNA from of viral RNA) by DNA directed DNA polymerase . This provirus is integrated into host cell . Now this provirus acts as template for viral RNA synthesis and also brings about cell transformation .

2-Protovirus Hypothesis ; suggests that the regions of DNA in vertebrate cells are transcribed to RNA and then back again to DNA . This process continues and

provides mechanism for gene amplification and cellular differentiation . Rarely abnormal events in this mechanism may result in the formation of oncogenic RNA virus genome.

3-DNA oncogenic virus ; hypothesis suggests integration of viral DNA with host genome . Under its influence the host cell undergoes malignant changes as a result of synthesis of viral coded antigens i.e. tumor antigen and tumor specific transplant antigen . virus genome may release the cell from normal regulatory mechanism of morphogenesis such as contact inhibition.

Dr- D.V-Thenain