**Fowl Adenovirus - 4 infection in chicken**

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**Abstract:**

In India poultry industry is affected of viral, bacterial, &parasitic disease. Inclusion body Hepatitis (IBH) also known as hydropericardium syndrome .IBH is one of the most important disease in chickens.PCR is used as a diagnostic tool for the detection of avain adenoviruses.FAV protein has a immunogenic properties which is used as vaccine for this disease.

**Keywords:** IBH, HPS, Penton, Hexon, ELISA, AGID, HPS

**Inclusion body hepatitis / Hydropericardium syndrome (IBH / HPS )**

Inclusion body hepatitis (IBH) was reported by Hemboldt and Frazier (1963) in the United States as necrotising hepatitis in 7-weeks-old chicken. Panisup *et al.,* (1982) reported spontaneous occurrence of IBH in chickens at the age of 5-10 weeks which had been immunosuppressed experimentally with IBD virus at the age of 1 day. The disease was reported in broiler flocks in several countries including Canada (Howell *et al.,* 1970), , Ireland (Young *et al.,* 1972) and Australia (Wells and Harrigan, 1974; United Kingdom (Laursen-Jones, 1972) Reece *et al.,* 1986, 1987). In India, IBH was first described by Grewal *et al.,* (1981) in 3-weeks- old broilers with about 15% mortality. The FAVs were classified as serotype 4 by restriction fragment length polymorphism patterns of hexon genes and whole genomes. Four strains of fowl adenovirus (FAV) were isolated from 4 flocks of broiler or layer chickens affected by hydropericardium syndrome in Korea (Park *et al*., 2011). In India, the disease was first noticed in some parts of Jammu and Kashmir, Punjab and Delhi during April-July 1994 (Sreenivas Gowda and Satyanarayana, 1994) though some cases had been seen prior to 1994 (Singh *et al.,* 1996). It spread to Uttar Pradesh in November 1994 (Ravi Kumar *et al.,* 1997) and this was followed by spread of disease throughout the country (Asrani *et al.,* 1997). In India, the farmers named this condition as Leechi disease because the heart, surrounded by hydropericardium, appears similar to a peeled Indian Leechi fruit. Hydropericardium syndrome has been observed in broiler chicken of either sex at the age between 3 and 6 weeks and occasionally in layers and breeder pillets at the age between 2 and 20 weeks (Sreenivas Gowda and Satyanarayanan, 1994; Ravi Kumar *et al.,* 1997).

In India, the disease was first noticed in some parts of Jammu and Kashmir, Punjab and Delhi during April-July 1994 (Sreenivas Gowda and Satyanarayana, 1994) though some cases had been seen prior to 1994 (Singh *et al.,* 1996).The virus exhibited cytopathic effects consisting of rounding, ballooning and clustering in primary chicken embryo liver cell cultures. In transmission electron microscopy, virus particles in hexagonal shape aggregated exclusively in the nuclei of hepatocytes of the chicken as the typical appearances in adenovirus infections. It spread to Uttar Pradesh in November 1994 (Ravi Kumar *et al.,* 1997) and this was followed by spread of disease throughout the country (Asrani *et al.,* 1997). In India, the farmers named this condition as Leechi disease because the heart, surrounded by hydropericardium, appears similar to a peeled Indian Leechi fruit. Hydropericardium syndrome has been observed in broiler chicken of either sex at the age between 3 and 6 weeks and occasionally in layers and breeder pillets at the age between 2 and 20 weeks (Sreenivas Gowda and Satyanarayanan, 1994; Ravi Kumar *et al.,* 1997).

**Fowl adenovirus serotype 4**

The adenoviruses constitute the Adenoviridae family of viruses, which is divided into two genera, Mastadenovirus and Aviadenovirus (Norrby *et al.,* 1976). The Aviadenovirus genus is limited to viruses of birds, whereas the Mastadenovirus genus includes human, simian, bovine, equine, porcine, ovine, canine, and possum viruses.

Fowl adenoviruses are non-enveloped icosahedral particles that range in size from 70-100 nm in diameter. It has 252 capsomers of which 240 are hexons and 12 pentons (Vertex capsomers). The location and organization of the 11 to 14 different proteins in the complex non-enveloped icosahedral capsid have been studied. The FAV genome consists of a linear double stranded DNA molecule of 43-45 kb in size, which is significantly larger than its human equivalent. The terminal sequences of each strand are inverted repeats hence the denatured single strands can form “panhandle” structures (50-200bp). (Zsak and Kisary, 1984).

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Cloning of FAV4 DNA, its penton gene and RE analysis of FAV4 reccombinant plasmid has been reported earlier (Rai, 2006; Rai *et al.,* 2007a,b,c; Tyagi and Singh, 2013, Tyagi, 2014). Nucleic acid vaccines containing alpha virus replicase gene based system are no a day gaining popularity among researchers for a wide range of infectious diseases and cancer.

The hexon protein is the major protein of the adenovirus capsid (Toogood *et al.,* 1989). Each hexon protein is composed of three identical polypeptide chains and the coding region for the hexon occupies nearly 10% of the human adenovirus genome. The hexon is the major component of the virion and has been shown to carry type, group and subgroup antigenic determinants (Norrby, 1969) and elicit protective immunity.An agar gel immunodiffusion (AGID) test has been developed for the diagnosis of disease caused by Indian isolates of group I fowl adenovirus Verma *etal*., (1971). In addition, an ELISA system has been adopted for detection of antibodies against FAV Dawson etal.,(1980), and indirect ELISA and dot-ELISA have been developed for detection of FAV antigen in chicken tissues using antiserum against FAV-1( Nagal *etal*.,1990). Viral neutralization test, ELISA and AGID tests have also been developed and compared for their ability to detect antibodies to FAV.(Asthana etal.,2011)

Effective immunization against HPSV through the use of inactivated vaccines prepared from liver homogenates of infected chickens is the major practice employed to control HPS (Balamurugan and Kataria(2006)]. However, HPS vaccines often fail to provide the desired level of protection under field conditions. Field observations suggest that the concurrent presence of infectious immunosuppressive agents such as IBD and CAV as well as noninfectious factors such as stress and aflatoxins probably interfere negatively with the desired outcome of HPS vaccination Afzal and Ahmad (1990). Thus, the success of a vaccination program against an infectious disease depends not only upon the use of efficacious vaccines, immune competency of chickens, and better management practices but also on the use of immune stimulants that can amplify the specific immune responses.(Toro;1999 and Munir;2007)

The development of a safe vaccine that can transmit strong passive immunity and protect broiler chicks With the use of computational immunology and immune-informatics, it is possible now to drastically reduce the time and effort required for identification of promiscuous epitopes. These can be designed to be broadly reactive (across HLA) and broadly conserved (across variant strains) sequences. Recently, the use of different bioinformatics tools was suggested for prediction of promiscuous B-cell epitopes in FAV-4 as a component of peptide-based vaccine (Shivachandra *etal*., 1999). Fav-4 consist of Hexon and penton gene.It may be 240 are hexon and 12 are penton. FAV-4 Penton gene use in PCR for diagnostic purpose as well as hexon gene has a immunogenic properties and its use in developing vaccine for controlling Hydropericardium disease in chickens.

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