

## ***Bovine Congenital Arthrogryposis & Hydranencephaly Outbreaks Attributed to Akabane Virus Infection in Iran***

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**Abstract:** In a herd of 700 Holstein breed cattle maintained in the suburbs of Sari, near the Caspian Sea Coast, north of Iran, an abortion and still birth of 7% was observed during 1988-1989. In addition, 6.5% of newborn calves were affected with congenital hydranencephaly, arthrogryposis and other defects. Clinicopathological, plus sero-epidemiological studies on the above mentioned herd and neighbouring sheep flocks, indicated that the outbreak could best be attributed to Akabane virus infection.

**Keywords:** *Virus diseases / Akabane virus / Iran / Arthrogryposis.*

### **Introduction**

As an arbovirus, akabane virus belongs to the simbu group of the bunyaviridae (Konno, 1982, Bishop & Shope 1979). The virus, first reported as an arthropod born, isolated from culicoides midges and mosquitoes (Doherty et al 1972) was later confirmed in Australia (Shepherd et al 1978), Israel (Noble et al 1971) and Japan (Oya et al 1961). The disease for the first time was reported in 1956 and 1957 in Australia (Blood 1956; Whitten 1975).

The disease which is prevalent from autumn to the next spring, causes abortion, stillbirth, premature birth and a congenital Arthrogryposis and Hydranencephaly syndrome (AG/HE) in cattle (Inaba, Kurogi & Omoro, 1975).

This comprehensive study deals with outbreak of Arthrogryposis / Hydranencephaly AG/HE in the north of Iran, based on histopathology and serology tests. In the best knowledge of the authors, this is the first report of bovine congenital Arthrogryposis and hydranencephaly in Iran.

## **Materials & Methods**

A total of 47 naturally infected abnormal calves and a number of aborted foetuses of sheep and cows were received from Mahdasht company (Dairy cattle centre) and Torkaman Port at the vicinity of the abovementioned cattle farm between 1988-1989. Ten calves with AG/HE and 4 still born were observed. Seven calves were submitted to the pathology Department of the Razi Institute.

Following observation of clinical symptoms, the calves were sacrificed and then autopsied. Samples from brain, spinal cord, striated muscles, liver, heart, kidneys, intestine and adrenal glands were taken and fixed in 10% buffered neutral formalin saline, embedded in paraffin, and then sectioned. They were 6  $\mu$  in thickness and stained with Haematoxylin and Eosin (HxE). Cross sections of the central nervous system containing brain (cerebrum, thalamus, cerebellum, midbrain, pons and medulla oblongata), cervical, thoracic and lumbar regions of the spinal cord were examined and the lesions were recorded.

Serology: Fifty bovine and forty four sheep blood samples were detected by HI test following the procedure suggested by Konno (Personal Communication 1989).

## **Results**

### *Clinical Signs:*

In seven calves received, dummy syndrome, depression, head pressing, incoordination, blindness and inability to suck and arthrogryposis were among prominent features. In fact the abnormality of the carpal joints prevented calves

to stretch their position and usually bent to the rear. Principle deformities of the musculo-skeletal system comprised kyphosis, scoliosis and torticollis.

### ***Gross Pathology***

At the autopsy hall, the skull was sliced and it was observed that the cerebral hemisphere was filled by clear fluid surrounded by a thin delicate membrane (Figure 1).

#### ***Serology:***

Blood samples were obtained from fortyfour sheep and fifty cows and they examined with HI test. The result showed that the range of antibody titer was between 10-80.

### ***Histopathological Findings***

#### ***Brain:***

The lesions included dilation of the ventricular, and prevascular cuffing consisting histiocytes, plasma cells and lymphocytes. Cystic cavities associated with hemorrhages were found in the midbrain, pons and medulla oblongata. Vascular lesions consisted of fibrous thickening of the blood vessels, which caused obstruction in some of them. Virchow-Robin spaces were also enlarged.

#### ***Spinal Cord:***

Cystic cavities were observed in the grey matter of the cord.

## **Discussion**

Akabane disease virus (ADV), an arthropod (Culicoides) born bunya virus of the simbu serogroup passes through the placental junction of ruminant species. If it enters the fetal environment and infects fetal lamb between 30 - 36

days and fetal calves between 76 - 104 days of gestation, causes hydranencephaly, while fetal calves, infected between 104 - 173 days of gestation could show arthrogryposis at parturition, (Kirkland & Barry 1985 Parsonson & Mcphee 1985). The factors which superimpose the infection mainly comprise:

**1) Season:**

The number of culicoides usually increases in the spring and may reach maximum during late summer and declines in late autumn (Murray, 1986).

**2) Climate:**

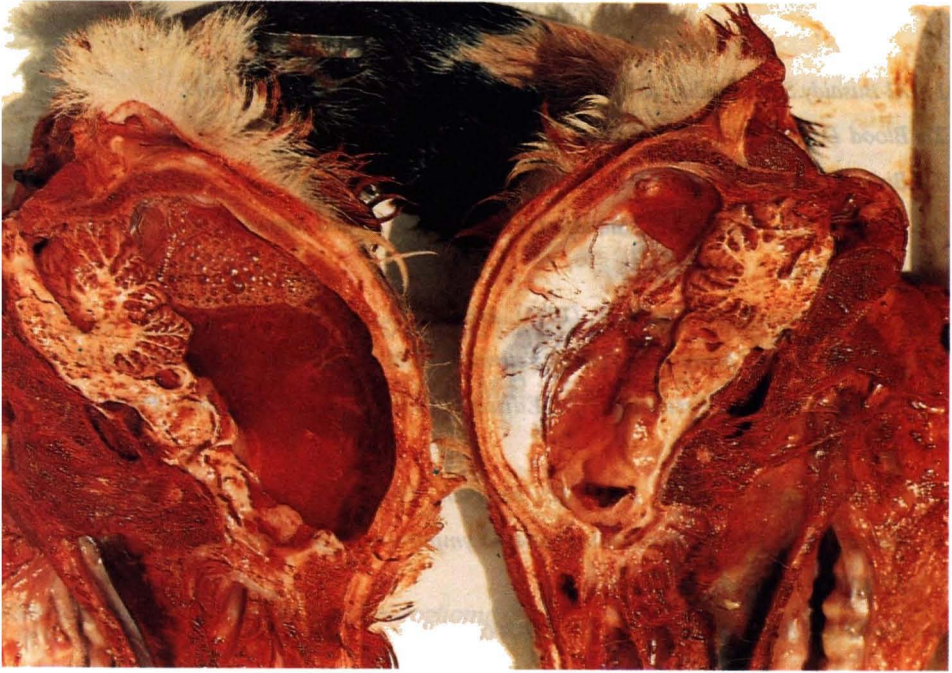
Wet summer is one of the prime factors causing the disease (A1- Busaidy, Mallor & Taylor 1988).

**3) Movement of Wind:**

Navai indicated that many of the species of culicoides in Oman, North Yemen and Bahrain have the same characteristics as those in Iran (Navai 1971). In fact, winds characteristics as are commonly occurring, can carry infected vectors (insects) into the Peninsula (Sellers 1980).

Since the ruminant species obtain maternal immunoglobulins, only from ingestion of colostrum milk, therefore immunoglobulins do not cross the placenta in normal pregnancy, hence, it can be inferred that any specific antibodies found in the serum of a newborn that has not yet suckled antibody, may respond positively by the fetus. The fetus is able to produce specific antibodies to pathogen from 70 days (sheep & goats) and 150 days (cattle) of gestation period.

According to the information already presented, it can be concluded that the occurrence of infection at different gestation periods, can lead to different picture of the disease such as clinical symptoms, gross and histopathological findings and seropositivity, all of which can be documented as the presence of the Akabane disease.



***Figure 1: substitution of the cerebral hemispheres by thin membrane, associated with clear fluid (Hydranencephaly)***

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