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Cyclopia: An extremely rare congenital anomaly

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Abstract
Cyclopia is a rare congenital anomaly and most severe form of holoprosencephaly, characterised by the single or fusion eye, microcephaly, absence of a nose, a proboscis above the eye. Most such embryos are either naturally aborted or are stillborn on delivery. In the present case a two year old doe gave birth to a dead male kid weighing about 2.45 kg had the features small and elongated head with single eyeball and absence of skeletal structure of the nose. The lower jaw was longer than the upper jaw with protrusion of tongue giving flat face form. The absence of nasal cavity and presence of a rudimentary proboscis above the pseudo-orbit provides typical Cyclops appearance. The causes of cyclopia are not well understood and it may be due to influence of genetic and environmental factors. At present cyclopia is not preventable and there is no treatment available. But in future genetic evaluations of the dam and sire of a defective fetus and analysis of other environmental factors leading to the cyclopia condition may help in prediction and control of this condition.

Keywords: Cyclopia; congenital anomaly; goat; single eye; microcephaly

Introduction
Cyclopia is a most severe form of holoprosencephaly, characterised by the failure to properly divide the orbits of the eye into two cavities. In cyclopia there is no separation between the right and left hemispheres of the brain. Cyclopia can lead to structural abnormalities of the head and face and associated with low survival rates. Most young ones born with cyclopia are stillborn or die within a few hours of birth. The most apparent sign of cyclopia is a single eye or a partially divided eye in a single socket. The other signs of cyclopia are the absence of a nose, a proboscis above the eye, microcephaly (small head), cleft lip, tooth abnormalities, hormonal abnormalities and genital abnormalities.

Causes and Diagnosis
The causes of cyclopia may be due to genetic factors, gestational diabetes, infections during pregnancy, exposure to UV light and certain medications during the organogenesis of the fetus in pregnancy. Some cases of cyclopia have been associated with a rare chromosomal condition called 'Patau Syndrome' which is known as trisomy 13. Sonic Hedgehog Gene Regulator is involved in the separation of the single eye field into two bilateral fields. The mutation of the Sonic Hedgehog Gene Regulator gene may result in cyclopia. Cyclopia develop during the first trimester of pregnancy, which can be diagnosed using ultrasound imaging. Brain malformations and other structural abnormalities appear on ultrasounds. MRI scan may also use to identify cyclopia.

Cyclopia in Livestock: Cyclopia may occur in livestock grazing on *Veratrum californicum* during gestation. Cyclopia may be induced by exposing the dams with x-irradiation during pregnancy and by giving cyclophosphamide and vincristine.

Case Observation
In the present case a two year old doe in livestock research station, kattupakkam, Chennai given birth to a dead male kid weighing about 2.45 kg had the features of Cyclops. The morphological examination of the fetus revealed presence of small and elongated head with single eyeball and absence of skeletal structure of the nose. The lower jaw was longer than the upper jaw with protrusion of tongue giving flat face form (Fig.1). The absence of nasal cavity and presence of a rudimentary proboscis above the pseudo-orbit provides typical Cyclops appearance. Both ears were normal and hairs were present all over the body (Fig.2). It was reported that the cyclops did not live due to inability to breathe.

Fig 1: Cyclopia kid with single eye and absence of skeletal structure of the nose

Fig 2: Cyclopia kid with protrusion of tongue and rudimentary proboscis

Discussion

The similar Cyclops condition was reported in various livestock species. Cyclopia are most commonly seen in pig and sheep and also reported in goat and cattle. Binns *et al*., 1963 [1] found that cyclopia malformation in newborn lambs in a flock of sheep and stated that this anomaly arises due to ingestion of *Veratrum californium* in pregnant ewes. Ozcan *et al*. (2006) [2] reported an atypical form of cyclopia in a stillborn Brown Swiss cross male calf and the most significant malformation was the presence of a median orbita-like opening that did not contain an eyeball, prosencephalic aplasia, brachygnathia superior and arrhinia and concluded that the possible cause of the congenital defect could not be ascertained.

Khasatiya (2010) [3] reported an Acebocephalus/cyclopia monster with epitheliogenesis imperfecta over the forehead and body, having rudimentary and separate eye balls and atypical deformed ears and jaw was delivered by traction in an HF crossbred cow. Akhil *et al*. (2019) [4] presented a case report on dystocia associated with malpresentation of atypical cyclopic monster with arhinic condition was delivered per-vaginally through fetotomy in a buffalo

Asloob *et al*. (2013) [5] presented a case report on a crossbred heifer gave birth of a live fetus with dome shaped head, centrally located orbit with protruding tongue giving it a monkey face like cyclopia appearance. Sivasudharsan *et al*. (2010) [6] reported a Schistosomus reflexus with cyclopia related dystocia in a Tellicherry doe. Karthickeyan *et al*. (2011) [7] observed cyclops in two different Large White Yorkshire piglets, which had varying features and stated that there was no involvement of boar since they were from different sire groups.

Conclusion

Cyclopia may occur in mammals, birds and fishes. In cyclopia generally the defect of the nose, and the eye is found in the median line of the face. Cyclopia are either aborted or are stillborn. The causes of cyclopia are not well understood and it may be due to influence of genetic and environmental factors. At present cyclopia is not preventable and there is no treatment available. But in future genetic evaluations of the dam and sire of a defective fetus and analysis of other environmental factors leading to the cyclopia condition may help in prediction and control of this condition.

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