

## Case Report

# Congenital Absence of a Teat in a Japanese Black Heifer

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A case of Japanese Black heifer with a congenital absence of teat (athelia) was observed at Highashi-Hiroshima Agricultural High School, Hiroshima Prefecture, Japan. The heifer was born after transfer of embryo from Japanese Black cattle. The sire of the heifer was a proven Japanese Black. The birth weight of the heifer was 27 kg. On physical examination of the heifer at 21 months after birth, the teat at fore left was absent and the remaining three teats were normal in shape without any physical abnormalities. Per rectal palpation of the genital organs revealed the normal cervix and uterine horns. It was difficult to palpate the ovaries due to the fat around the organs. Blood samples were taken for cytogenetic and DNA testing. The heifer had normal chromosomal set. The heifer was culled due to its mammary abnormality. This might be the first to report a case of congenital absence of a teat in Japanese Black heifers.

## 1. Introduction

Congenital aberrations in the mammary gland of the cows include many structural defects; however, the only one of significance is supernumerary teats. Supernumerary teats may be located on the udder behind the posterior teats, between the front and hind teats, or attached to either the front or hind teats [1]. A case of mammary gland aplasia in a fertile purebred Guernsey heifer, 33 month of age was reported [2]. On gross examination the mammary gland appeared small, underdeveloped. The teats were smaller than normal, but the teat orifices were patent. They attributed this condition to the failure of secondary sprouts to form during embryonic development [2].

In India, some reports on the congenital affections of the udder and teats in buffaloes were published. A 4-year-old Murrah buffalo with a history of absence of teats was reported [3]. On clinical examination, no teat was observed on the udder and the normal udder was engorged with milk. All the teats were represented by small eruptions with dribbling of

milk on pressure [3]. Four cases of developmental abnormalities of the udder and teats (joined teats, uneven teats, branched teat canals, and single functional teat of the udder) in riverine buffaloes were also reported [4]. In addition, a buffalo with only two well-developed hind quarters along with two developed teats was described [5] and the absence of mammary gland and teats in a she goat was described [6].

In a Duroc and Berlin Miniature pig (DUMI) population, 53.6% suffered from mammary gland abnormalities, 42.2% had inverted teats, and 17.9% showed extra teats [7].

Congenital aplastic deformities of the breast include amastia (total absence of breasts and nipple), athelia (absence of the nipple), and amazia (absence of the mammary gland) [8]. The most severe form is amastia, the complete absence of glandular tissue, nipple, and areola. Hypoplasia, the presence of very small rudimentary breasts, is the most common form. Amastia and hypoplasia may be associated with scalp defects, ear abnormalities, renal hypoplasia, and cataracts in patients with the rare autosomal dominant Finlay-Marks syndrome [9]. A 17 years female, the fifth child of a normal pregnancy



FIGURE 1: Japanese Black heifer with athelia showing absence of the fore left teat.

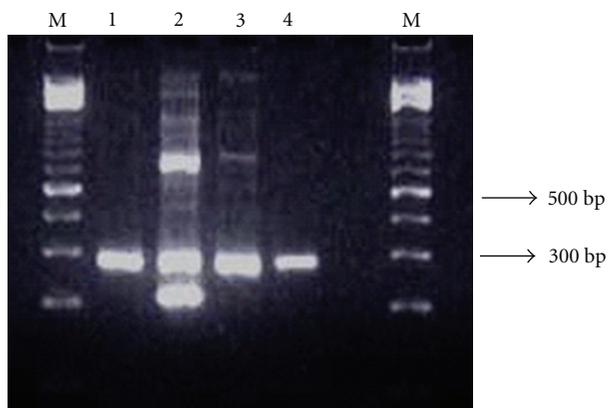


FIGURE 2: DNA analysis of sex chromosome of the heifer (M is ladder marker of 100 bp). Lane 1: Heifer with athelia, Lane 2: Normal bull, Lane 3: Normal heifer, Lane 4: Normal cow.

was delivered by cesarean section. One week after birth, the parents noticed the absence of a nipple-areola complex [10].

Available literature reveals no reports regarding absence of a teat (athelia) in Japanese Black cattle.

## 2. Case Report

A Japanese Black heifer was born on 20th August 2001 at Highashi-Hiroshima Agricultural High School after transfer of embryo originated from proven Japanese Black sire and dam. Her birth weight was 27 kg. The heifer was reared for fattening purpose and at the age of 21 months, she was noticed to have only three teats. On physical examination, the heifer showed three teats, the teat at fore left was absent (Figure 1).

Palpation per rectum revealed a normal cervix and uterine horns. Palpation of the ovaries was difficult due to over fattening of the heifer. The vulva of the heifer seemed to be smaller than normal size.

A heparinized blood sample was taken under sterile condition, for genetic testing of any chimerism. Genomic DNAs of the heifer with athelia as well as a normal heifer, a

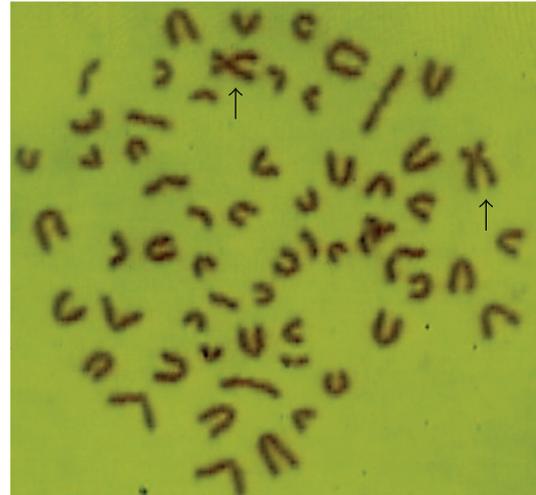


FIGURE 3: Cytogenetic analysis of the heifer with athelia. The heifer showed normal chromosomal set with XX chromosome (Arrows).

cow, and a bull were isolated from 300  $\mu$ L heparinized blood using Puregene kits (USA). The DNAs were amplified with Y-chromosome-specific DNA primer AMX/Y; [AMXY-F (CAGCCAAACCTCCCTCTGC), the DNA-amplified fragment size was 280 bp], and [AMXY-R (CCCGCTTGGTCT-TGTCTGTTGC), the DNA amplified fragment size was 217 bp]. The reaction mixtures contained 14.3  $\mu$ L of distilled water, 2  $\mu$ L 10x PCR buffer, 2  $\mu$ L of dNTPs, 0.4  $\mu$ L of each primer, 0.8  $\mu$ L of genomic DNA and 0.1  $\mu$ L of Taq Gold polymerase. Samples were amplified for 35 cycles at the following temperatures: denaturation at 95°C for 1 min; annealing at 57°C for 30 s; extension at 72°C for 1 min. The PCR products were analyzed by gel electrophoresis on 3% (w/v) TBE agarose gel stained with 0.5  $\mu$ L/mL ethidium bromide and visualized under ultraviolet light. The heifer had a normal sex chromosome (Figure 2). After obtaining the result of genetic analysis, another heparinized blood sample was taken under a sterile condition for chromosomal analysis. Leucocytes of peripheral blood were cultured in the medium containing calf serum and phytohemagglutinin-M and were analyzed for chromosomal abnormalities. Fifty metaphase plates on the slides stained with Giemsa solution were observed and number of cells was counted under the microscope [11]. All of the analyzed metaphases had 60 chromosomes including two X chromosomes; the karyotype was normal (Figure 3).

## 3. Discussion

The absence of mammary gland in human is very rare. In all the cases reported in human, there was no indication of chromosomal abnormalities in those patients with such mammary gland defects. In accordance with these reports, the case reported in this study had no autosomal or sex chromosomal abnormalities. Many researchers indicated that the inactivating mutations in the PTH1R (absence of functional type 1 parathyroid hormone) is associated with complete

amastia and athelia (lack of nipples) in the human beings [12], while others stated that ectodermal dysplasia was associated with variable failure of breast development [13–15].

Parathyroid hormone-like hormone gene (PTH LH) and the parathyroid hormone/parathyroid hormone like hormone receptor 1 (PTH R1) were shown to regulate epithelial mesenchymal interactions during the formation of the mammary gland in mice [16]. Therefore, PTH LH and PTH R1 are functional candidate genes for traits related to mammary gland and teat development [17].

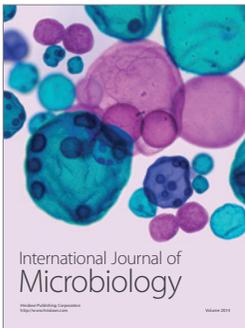
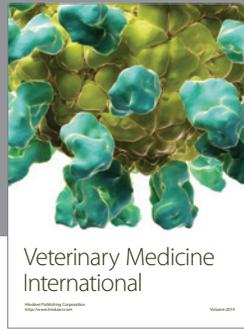
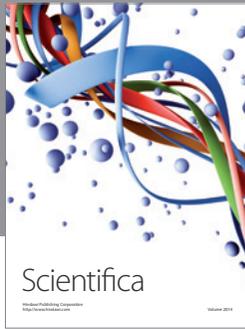
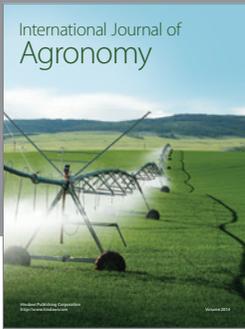
In cows, the udder is a very important organ and of economic value in producing milk for offspring and for other economical purposes. Since congenital anomalies in the udder are of great concern, more studies are needed to clarify the causes of such abnormalities. This might be the first to report a case of absence of a teat in a Japanese Black heifer.

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