CLINICAL AND ANTIGENIC DETECTION OF ADENOVIRUS IN YOUNG CALVES IN BABYLON GOVERNORATE, IRAQ

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ABSTRACT

This study aimed to detect adenovirus in faeces of calves suffering from diarrhoea by using chromatographic examination. Calves were aged from one day old to four months of age. Calves were obtained from Babylon governorate in Iraq during the months of November 2019 to April 2020. From 118 samples, 20 positive samples with a percentage of 16.9% were recorded. The diseased calves showed an increases of the breathing rates, body temperature and pulse rates. The observed clinical signs included nasal discharge, cough, weight loss, abdominal distention and hair loss as 18/20 (90%), 14/20 (70%), 17/20 (85%), 18/20 (90%) and 17/20 (85%), respectively. The infection and affection were highest in the younger ages, 1 month old (24.4%) and lowest at 4 months old (5.5%).The highest infection rate was also recorded in winter (in December 28.5%) and the lowest rate was recorded in April (10%). Adenovirus in diarrhoeic calves were slightly higher in females than males, as they were 18.3% and 15.5), respectively. The adenovirus infections were higher in younger calves (1 month old), at low temperatures (in December) more than older calves (4 months old) and higher temperature (in April). A less food intake was a predisposing factor. It could be concluded that the presence of adenovirus infections in calves causes diarrhoea which was higher in younger calves and slightly higher in females than males, less food are a predisposing factor.

***Key words*:** Adenovirus, virus, calves, Iraq

Introduction

Adenoviruses are double stranded DNA, non-enveloped viruses with icosahedral capsid symmetry composed of 252 capsomers, the size of genomes ranges between 24 and 45 kb (Davison *et al*., 2013; Berk, 2007). The virus can cause respiratory and enteric infections of calves. Bovine adenoviruses (BAVs) may be cause a variety of clinical signs including conjunctivitis, pneumonia, diarrhoea and polyarthritis. The virus cause bovine respiratory disease complex (BRDC) in cattle which causes serious economic losses for cattle industry (Rowe *et al*., 1953). Adenoviruses were first isolated from adenoid tissues by two independent groups attempting to identify the causative agents of acute respiratory infections (Hilleman and Werner, 1954). They have been isolated from mammals, birds, reptiles and other species (Benko *et al*., 2002). Their replication is mostly limited to single host species but it can present asymptomatically in species other than the natural host (Shenk, 2001).

Materials and Methods

Animals and clinical signs

Faecal samples from 118 diarrhoeic calves were collected during a period of 6 months (November, 2019 to April, 2020) from different animal dairy farms and sales locations of Babylon using aseptic condition to avoid contamination, placed in sterile plastic bags, ice-based and transported the lab. The number of specimens samples were 58 from males and 60 from females. Faecal samples were stored at -20°C until the required tests performed. The age of calves ranged between 1 to 4 month.

Data collected were temperature, plus, respiration, appetite, faeces consistency, seasonal related information, age, and gender plus health information regarding any clinical signs observed or told by the calf owner using a questionnaire paper included animal related and owner sections.

Collection of faeces samples

Faecal samples were aseptically collected in plastic container in sterile tubes with normal saline and stored in ice box until arrived to the laboratory.

One-step adenovirus rapid test

One-step adenovirus rapid test OSART was performed using One-Step (CerTestBiotec, Germany).

The principles of the OSART, which is a chromatographic-based immunoassay for the high degreed accuracy qualitative detection of RV antigen in the feces of bovine, porcine, and canine. Specific RV antibodies were used in test band as both capture and result.

Results and Discussion

Result of clinical examinations

Through the clinical signs of calves in which chromatographic examinations appear positive, they are as follows: 18/20 (90%), 14/20 (70%), 17/20 (85%), 18/20 (90%), and 17/20 (85%) for nasal discharge, cough, weight loss, abdominal distention, hair loss, respectively (Table 1).

For the appetite section, the sub-categories were anorectic and loss of appetite, that showed 20% and 80%, respectively. The consistency of faeces appeared as watery, soft in nature in 40% and 60%, respectively (Table 2).

Seasonal and months variations

The results of examining the samples that collected 118 samples for calves diarrhoea for the period from November 2019 to April 2020 showed that the number of positive samples for chromographic examination of adenovirus is 20 samples

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Table 1: The observed clinical findings of the temperature, respiratory rate and heart rate of calves infected with adenovirus.

Parameter	No. of animals	Average (Mean±SE)
Temperature (°C)	20	38.9-39.7 (39.3±0.18)
Respiratory rate (Resp/cycle)		90-108 (99±1.05)
Pulse rate (pulse/minute)		20-29 (25±1.33)

Table 2**:** Result of positivity for an adenovirus chromatographic examination in calves suffering from diarrhoea with clinical signs

Clinical signs		No. of affected animals/seropositive	percentage (%)
Nasal discharge		18	90
Cough		14	70
Weight loss		17	85
Abdominal distention		18	90
Hair loss		17	85
Appetite	Anorectic	4	20
	Loss	16	80
Faeces	Watery	12	60
	Soft	8	40

with a percentage of 16.9%, where the highest infection rate in December was 28.5% and the lowest rate was in April with a rate of 10% while the remaining months were 15.7%, 20%, 15%, 11% (November, January, February and March, respectively (Table 3).

Results according to ages

The results of the research showed that the younger ages are more affected, according to positive chromatographic examination, calves at the age of one month 11/42 (24.4%), which is the highest percentage, while the lowest were 4 months old, they were 1/18 with a percentage of (5.5%), and for the rest of the months it was 6/35 (17.1%), 2/20 (10%) for two and three months of age, respectively (Table 4).

Results according to sex

The positive results of a chromatographic examination of adenovirus in calves diarrhoea according to gender, showed that females were slightly higher than males, as they were 11/ 60 (18.3%) and 9/58 (15.5%), respectively (Table 5).

This report describes the first confirmation of adenovirus involvement in an episode of calf diarrhoea that resembled the weak calf syndrome noted elsewhere (McClurkin and Coria, 1975). Of the 118 sample diarrhoea calves suffering from diarrhea at the age of 1-4 months, the results were (16.9%) positive samples, detected by a commercial kit (Rida Quick rotavirus/adenovirus-combi) adenovirus diagnosis. This kit enables virus detection in few minutes (Brenner *et al*., 2005). The obtained results (Table 1) showed that the recorded temperature ranged from 38.9°C to 39.7°C which was higher than the normal (38.2°C), respiratory rate was 20-29 r/min. which was quick quality style. Heart rate was 90-108 beats/ min, while pulse quality was mild to weak (Table 1), and this was in agreement with Constable *et al*. (1998). Dehydration that caused from diarrhoea leads to a decrease in blood volume, causing activation of the compensatory mechanism,

Table 3: Infection rate of adenovirus by chromographic examination according to months of study

Months	No. of examined animals	Positive (%)
November	19	3 (15.7)
December	21	6 (28.5)
January	20	4 (20)
February	20	3 (15)
March	18	2 (11)
April	20	2 (10)
Total	118	20 (16.9)

Table 4: Result of positivity for an adenovirus chromatographic examination in calves suffering from diarrhoea with age.

Age / year	No. of animals	Positive (%)
1 months	45	11 (24.4)
2 months	35	6 (17.1)
3 months	20	2 (10)
4 months	18	1 (5.5)
Total	118	20 (16.9)

Table 5: Result of positivity for an adenovirus chromatographic examination in calves suffering from diarrhoea sex wise.

Sex	No. of animals	Positive (%)
Males	58	9 (15.5)
Females	60	11 (18.3)
Total	118	20 (16.9)

so the work of the heart and breathing increases in their rates. Anorexia is the result of an increase in temperature and pain in the intestine resulting from a viral and bacterial infection this agree with findings of Whitehead and Anderson (2006).

The clinical signs appeared on the adenovirus in calves depending on the results of the chromatography assay, are listed in the Table 2. The clinical signs seen were categorized into 7 sections, 90%, 70%, 85%, 90%, 85%, 20%, 80%, 60%, 40%, nasal discharge, cough, weight loss, abdominal distention, hear loss, appetite and faeces, respectively. These results are in agreement with Lehmkuhl *et al.* (1975); Thompson *et al*. (1981), Brenner *et al*. (2005), Vaatstra *et al*. (2016). Which showed the calf was emaciated, dehydrated and had mild diarrhoea, anorexia, hyperthermia with adenovirus in young calves.

Faeces were watery and weight loss, these sections were sub categorized for classification and characterization purposes. For the appetite section, the sub-categories were anorectic and loss that showed 20% and 80%, respectively, for incidence rates. The consistency appeared as watery or soft in nature in 60% and 40%, respectively (Table 2), this results agreement with Brenner *et al*. (2005), pasty and sometimes contained blood.

Table 3 showed that the highest incidence of adenovirus affection was in December at a rate of 28.5%, while the lowest rate was in April by 10% Because of changes in the atmosphere and a decrease in climate temperature, which is reflected in the health of calves, as well as the lack of food during the winter. These results correspond to Vaatstra *et al.* (2016), concentration of injuries in cold weather, lack of food and decrease in immunity, Mortality events involving calves on

winter range have been reported associated with malnutrition and pasteurellosis, including reports from the US National Elk Refuge (Thorne 1982; Franson and Smith, 1988).

Table 4 indicated that the results of the positive chromatographic examination for calves were at the age of 1 month (24.4%), which is the highest percentage, while the lowest are 4 months old (5.5%) (Darbyshire *et al.,* 1966; Woode and Bridger, 1975). Table 4 also shows that the infections with adenovirus are most likely to be less than a month old, It is consistent with our results. This is due to a decrease in immunity from hunger, deprivation or exposure to extreme cold while Cole (1970), Lehmkuhl (1975), Thompson *et al.* (1981) found in his study that the infection is concentrated at the age of 1-4 weeks. This is also supportive of our findings.

Table 5 deals with adenovirus in calves diarrhoea, according to gender, It showed that females were slightly higher than males, as they were (18.3%) and (15.5%), respectively, The difference in the percentage is that the female samples were slightly more than the male, which was reflected in the percentage. Our results are inconsistent with Gras *et al*. (2017), that which indicates that the percentage in males is higher than that of females.

Approval of the ethics committee

The present study was submitted to the Ethical Committee of the Experimental Animal Production and Research Center of the College of veterinary medicine, AL-Qasim Green University, Babylon, Iraq and was approved under the protocol number 2020-77.

References

Benko M, P Elo, K Ursu, W Ahne SE, LaPatra D Thomson and B Harrach (2002) First molecular evidence for the existence of distinct fish and snake adenoviruses. *J. Virol.* **76**: 10056-10059.

Berk AJ (2007) Adenoviridae: The viruses and their replication. In: Fields Virology. 5th ed. D Knipe and P Howley (Ed.). Philadelphia: Wolters Kluwer Health/Lippincott Williams and Wilkins. pp. 2355-2394.

Brenner J, D Elad, M Bernstein, I Dagoni, V Pálfi and H Yadin (2005) The detection of an unidentified type of adenovirus in the stools of calves with weak calf syndrome by use of a commercial kit designed for the detection of human adenoviruses. *J. Vet. Med. Series B*. **52**(2): 98-101.þ

Cole AM (1970) The isolation of adenoviruses from calves with pneumonia. *Aust. Vet. J*. **46**: 569-575.

Constable PD, Walker PG, Morin DE and JH Foreman (1998) Clinical and laboratory assessment of hydration status of neonatal calves with diarrhea. *J. Am. Vet. Med. Assoc.* **212**(7): 991-996.

Darbyshire JH, AR Jennings, PS Dawson, PH Lamont and AR Omar (1966) The pathogenesis and pathology of infection in calves with a strain of bovine adenovirus type 3. *Res. Vet. Sci.* **7**(1): 81-95.

Davison AJ, MB Benko and Harrach (2003) Genetic content and evolution of adenoviruses. *J Gen Virol.* **84**(11): 2895-908.

Franson JC and BL Smith (1988) Septicemic pasteurellosis in elk (Cervuselaphus) on the United States National Elk Refuge. *Wyoming. J. Wild. Dis.* **24**: 715-717.

Gras CK, M Demoliner, AKA Eisen, FR Spilki and A Henzel (2017) Seroprevalence of Bovine adenovirus and Enterovirus Antibodies reveals different infection dynamics in cattle herds. *Acta Scientiae Veterinariae.* **45**: 1-6.þ

Hilleman MR and JH Werner (1954) Recovery of new agent from patients with acute respiratory illness. *Proc. Soc. Exp. Biol. Med.* **85**: 183-188.

Lehmkuhl HD, MH Smith and RE Dierks (1975) A bovine adenovirus type 3: isolation, characterization, and experimental infection in calves. *Archives of Virol.* **48**(1): 39-46.þ

McClurkin AW and MF Coria (1975) Infectivity of bovine adenovirus type 5 recovered from a polyarthritic calf with weak calf syndrome. *J. Am. Vet. Med. Ass.* **167**: 139-141.

Rowe WP, RJ Huebner, LK Gilmore, RH Parrott and TG Ward (1953) Isolation of a Cytopathogenic Agent from Human Adenoids Undergoing Spontaneous Degeneration in Tissue Culture. Proc. *Soc. Exp. Biol. Med.* **84**: 570-573.

Shenk T (2001) Adenoviridae: The viruses and their replication. Fields Virology. Lippincott Williams & Wilkins, Philadelphia, pp. 2265-2300.

Thompson KG, GW Thomson and JN Henry (1981) Alimentary tract manifestations of bovine adenovirus infections. *The Canadian Vet. J.* **22**(3): 68.þ

Thorne ET (1982) Pasteurellosis. In: Diseases of wildlife in Wyoming, 2nd ed., Thorne ET, Kingston N, Jolley WR, Bergstrom RC, editors. Wyoming Game and Fish Department, Cheyenne, Wyoming, pp. 72-77.

Vaatstra BL, DJ Tisdall, M Blackwood and RA Fairley (2016) Clinicopathological features of 11 suspected outbreaks of bovine adenovirus infection and development of a real-time quantitative PCR to detect bovine adenovirus type 10. *New Zealand Vet. J.* **64**(5): 308-313.þ

Whitehead CE and DE Anderson (2006) Neonatal diarrhea in llamas and alpacas. *Small Ruminant Res.* **61**(2-3): 207-215.

Woode GN and J Bridger (1975) Viral enteritis of calves. *The Vet. Record.* **96**(4): 85-88.þ