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SIGNIFICANCE OF SELECTED CLINICOPATHOLOGIC VARIABLES IN CALVES WITH BRONCHOPNEUMONIA

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ABSTRACT

The present study was delineated to evaluate the significance of using a qualitative cardiac troponin I (cTnI) kits for the diagnosis of cardial injury in calves suffering from bronchopneumonia. A total number of 120 calves were enrolled in this study. Out of these calves, 100 animals exhibited various clinical symptoms of acute (n = 50) and chronic (n= 50) bronchopneumonia, while other 20 apparently healthy calves were selected and served as a control. The concentration of cTnI was quantitatively and qualitatively determined in blood sera using either ELISA kits or a rapid assay with a commercial kit, respectively. Also. blood samples were used to estimate malondialdehyde (MDA) levels, glutathione peroxidase (GPx) activity, reduced glutathione (GSH) levels, and superoxide dismutase (SOD) activity. Our obtained results revealed that the quantitative cTnI was significantly elevated in chronically affected calves compared to those of acute ones and the control.The qualitative cTnI test had 90% diagnostic accuracy with 87.5% sensitivity, 67% specificity, 100% positive predictive value and 67% negative predictive value. Values of MDA were significantly increased in all diseased calves compared with control and in chronic cases compared with acute ones. Nevertheless, values of GSH and SOD activity were significantly lowered in all diseased calves compared with controls and in chronic ill calves than those having acute infections. GPX activity was higher in acutely ill calves than controls and those with chronic infection. It could be concluded that the analysis of pro-oxidants and oxidative stress markers could have an important role in diagnosis of bronchopneumonia in calves as well as the quantitative and qualitative analysis of cTnI could be used also as a tool in diagnosis of cardiac injury in calves suffering from chronic bovine respiratory disease.

Keywords: Bovine respiratory disease, Oxidative stress, quantitative, qualitative cardiac troponin I.

INTRODUCTION

Bovine respiratory disease (BRD) is becoming one of the most important and economically relevant disorders in cattle practices. Inflammation caused by BRD continues to be one of the greatest challenges facing cattle producers and managers **(Soltesova et al., 2015).**The disease causing high mortality rate, reduced feed conversion, decreased feed intake and reduced meat quality **(Urban et al, 2012).** BRD is being multifactorial and developed as a result of a complex of interactions among environmental factors, host factors and pathogens **(Radostits et al., 2007).** In ruminants, oxidative stress has been involved in various pathological conditions (**Lykkesfeldt et al., 2007 and Kataria , 2012).** The condition results from an imbalance between the production of reactive

oxygen species and the antioxidant status that leads to cell damage (**Macnee , 2001**). The presence of oxidative stress in calves with bronchopneumonia particularly in chronic pneumonia has also been reported **(Alqudah, 2009).**The measurements of products of oxidative injury like malondialdehyde (MDA) and antioxidant variable like superoxide dismutase (SOD), glutathione peroxidase (Gpx), reduced glutathione (GSH) and catalase are being useful markers (**Scharma et** al**, 2011).**

Cardiac troponin is a myofibrillar protein that regulates contractions of the heart. It has two forms, cardiac troponin I (cTnI) and cardiac troponin T **(Hanedan et al., 2015).** Measurement of concentrations of cTnI has been considered the gold standard diagnostic test for the detection of cardiac injury in human patients (**Hasic et al., 2003 and O'Brien et al**, **2008).** Analysis of cTnI is more sensitive and specific useful indicator for detecting and quantifying an active myocardiac injury than lactate dehydrogenase (LDH) (Babuin **and Jaffe**, **2005**; **Serra et al., 2010**). Given that there is over 96% homology among human and bovine cardiac troponin I (**O'Brien et al.,** 1997), it allows researchers to use the human assays to easily identify cTnI in cattle serum (**Varga et al., 2009a**). Recently, cTnI has been evaluated by bovine researches as biomarker for direct and indirect cardiac damage injury (**Gunes et al**., **2008**; **Peek et al**., **2008**; **Mellanby at al**., **2009**; **Varga et al**., **2009a**;**Varga et al**., **2009b**, **Hanedan et al**., **2015 and Aydogdu et al**., **2016).**

The effectiveness of qualitative cTnI kits that designed for human use has been investigated for the diagnosis myocardiac cell damage in cattle with primary cardiac diseases (**Gunes et al**., **2008 and Tunca et** al**., 2008**). Our study was done for the aim of study the oxidative stress associated with bronchopneumonia in calves as well as the evaluation of the effectiveness of using a qualitative test cTnI kits for the diagnosis of myocardial injury in calves suffering from bronchopneumonia.

MATERIALS AND METHODS

A total of number 120 calves, at 3 to 6 month of age of both sexes (60 males, 60 females) and ranged from 100 kg to 150 kg body weight, were used in this study. Out of these calves, 100 animals exhibited various clinical symptoms of acute (n = 50) and chronic (n= 50) bronchopneumonia, while 20 apparently healthy calves were served as a control group. The examined animals were selected from herds that located at Dakahlia governorate during the period between May 2015 and October 2015.

Clinical evaluation

The detailed physical examination of each animal was carried out and the clinical observations were recorded according to the standard procedure given by **Radostits et al**. **(2000)** as shown in table 1.

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Ten milliliter of blood was drawn from each calf via jugular vein puncture into a tube containing EDTA as well as a plain tube. The former tube was rapidly centrifuged at 1500 rpm for 10 minutes to obtain plasma and RBCs. Blood plasma was collected to measure MDA levels colorimetrically using commercial test kits (Lipid peroxide, Biodiagnostic, Egypt, CAT: No MD 25 29) according to **Ohkawa et al**. **(1979),** while RBCs were washed four times with 3 ml of isotonic saline solution and centrifuged for 10 minutes at 4000 rpm at 4C. Red blood cells were then lysed by cold de-

ionized water.The haemolysate was further used to quantify CPx activity, GSH levels, SOD activity by using commercially available kits supplied by Biodiagnostic, Egypt (CAT: No GP 2524; GR 25 11 and SD 25 21) according to **Paglia and Valentine** (**1967**); **Beutler et al**. (**1963**) **and Nishikimi et al**. (**1972**), respectively. The other blood sample was left at room temperature to clot and then centrifuged at 3000 rpm for 10 minutes. Only clear non hemolysed sera were collected stored at -20 C for estimating values of (cTnI) by using commercially available human ELIZA kits (Troponin I ELISA, Calbiotech, USA, CAT: No 1015C) according to the method adopted by O **Brien et al**. **(1997).** The concentration of cTnI was qualitatively determined in serum samples using rapid assay with a commercial kit (cTnI rapid test cassette manufactured by Hangzhou Biotest Biotech Company, China with an absolute detection limit of 0.5ng/ml according to **Alpert et al. (2000)**.

Statistical Analysis

The obtained data were statistically analyzed using statistical software program (SPSS for Windows, version 15, USA) according to **Aydogdu et al. (2016).**

RESULTS

The obtained clinical observations associated with acute bronchopneumonic calves were depression, anorexia, high fever, harried respiration, polypnea, with serous to seromucoid nasal discharge, frequent coughing, conjunctivitis and exaggerated vesicular sound to crackles lung sound while the chronic diseased ones showed moderate fever, tachycardia, polypnea, profuse bilateral mucopurulent nasal discharges, wheezes and crackles lung sound as well as infrequent moist productive cough. Additionally, dyspnea was observed in some cases. Clinically, diseased calves demonstrated statistically significant ($P< 0.05$) higher values of heart rate, respiratory rate, rectal temperatureand clinical index score than those of controls and in acutely ill calves than those with chronic bronchopneumonia **(Table 2).** Biochemically, the values of MDA were significantly increased in all diseased calves as compared with those of the control group and in chronic cases compared with acute ones. Nevertheless, GPx activity , GSH levels and SOD activity were significantly lowered in chronically ill calves than those of the control group. With the exception of GPx activity, the values of GSH and SOD activity were statistically lowered in chronically ill calves than those having acute case **(Table 3).** The quantitative cTnI levels were significantly ($P < 0.05$) higher in chronically diseased calves than those of acute infections and controls **(Table 3).**The rapid qualitative cTnI test gave positive results in 70 % (n = 35) among all chronically diseased calves. In the contrast, all controls, acutely ill calves and 30 % of chronically ill calves demonstrated negative results. Considering that the gold standard of the test is being the serum cTnI, in calculations, our findings revealed that the diagnostic sensitivity of the kit is 87.5%, specificity 67%, PPV 100%, NPV 67% and diagnostic accuracy 90%.

Table 1. Description and levels of clinical illness index scores in calves.

	Variable	level
1	Cough	Dry cough=1; moist cough=2 Absent=0;
2	Nasal discharge	Absent = 0; serous discharge =1; mucoid discharge = 2; mucopurulent = 3; purulent = 4
3	Heart rate	55-90 beat/min =0; 91-100 beat/min =1 ; 101-120 beat/min =2; >120 beat/min =3
4	Respiratory rate	10-40 cycle/min =0; 41-60 cycle/min=1; 61-80 cycle/min=2 , 81-100 cycle/min=3 , >100 cycle/min =4
5	Temperature	38-39.5 ^{0C}=0 ; 39.6-40 ^{0C} =1; 40.1-41 ^{0C} =2; >41 ^{0C} =3
6	Appetite	Inappetance=1; anorexia=2
7	Alertness	Alert=0; mild depression=1; severe depression=2
8	Dyspnea	Absent=0; mild dyspnea=1; severe dyspnea=2
9	Lung sound	Normal vesicular sound=0; exaggerated vesicular sound=1; wheezes=2; crackles=3
10	Conjunctivitis	Absent=0; slight conjunctivitis=1; severe conjunctivitis=2

Table 2. Clinical findings in calves with acute and chronic bronchopneumonia

	Temperature T^{o}C	**R.R. Cycle/Min.**	**H.R. Beat/Min.**	**Clinical score**
Control (n=20)	38.5 ±0.1^{a}	22.5±2.5^{a}	65.6±5.5^{a}	0.00
Acute (n=50)	41.1±0.3^{b}	62.7±8.6^{b}	120±7.0^{a}	18.54±2.84^{a}
chronic (n=50)	39.6±1.5^{c}	50.02±6.5^{c}	90.5±7.3^{b}	14.02±2.50^{b}

a,b,c: Means with different superscript letters are significantly different at $p<0.05$.

Table 3. Mean ± SD of cardiac troponin I and oxidative stress markers in calves with acute and chronic bronchopneumonia compared with those of the control group.

Groups / Variables	Control (n=20)			Acute (n=50)			Chronic (n=50)			P-Value
MDA (nmol/ml) levels	8.06	±	1.95[a]	13	±	3.46[b]	20.77	±	4.21[c]	0.00
Glutathione peroxidase (mu/ml) activity	1680.9	±	472.2[a]	3040. 5	±	1604.26[b]	747.87	±	280.97[c]	0.00
Gltathione reduced (mg/dL) levels	7.92	±	2.9[a]	3.15	±	1.2[b]	2.36	±	0.89[c]	0.00
SOD (U/ml)	364.42	±	37.44[a]	234.43	±	46.15[b]	177.4	±	27.15[c]	0.000

a,b,c: Means with different superscript letters are significantly different at p< 0 . 05.

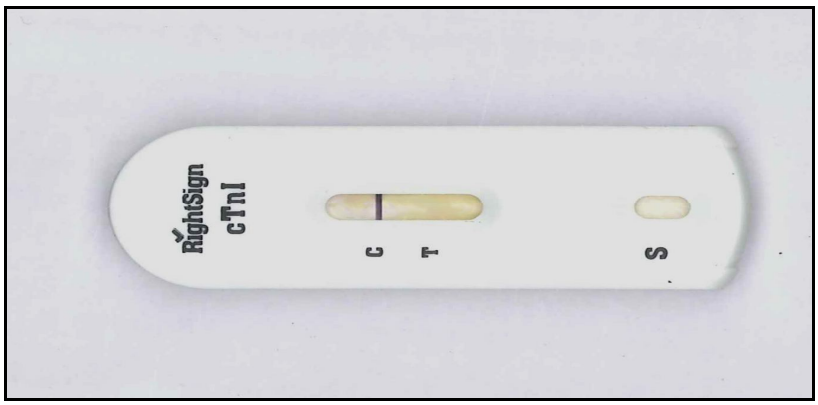

Photo 1. Rapid cTnI assay kit, negative in serum, Only one line appears in the control line region © and no line appears in the test line region (T)

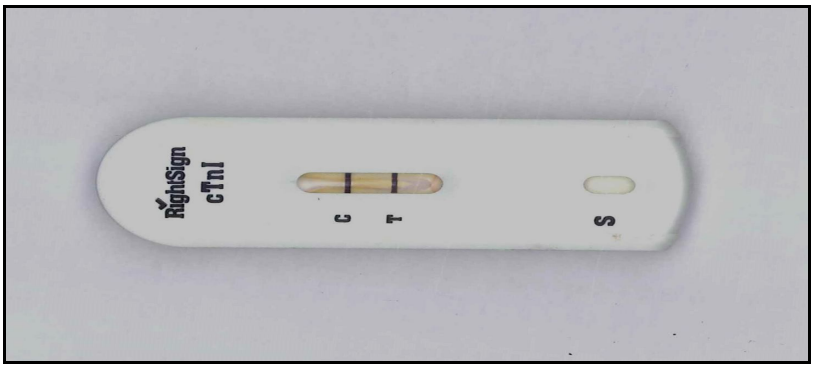

Photo 2. Rapid cTnI assay kit, strong positive in serum, 2 clear red brown lines appear in the reading windows (one line in the control line region © and another apparent line appears in the test line region (T))

Photo 3. Rapid cTnI assay kit, weak positive in serum, 1 non clear (light) red brown line appears in the test line region parallel to the control line

DISCUSSION

The present study presents an attempt to evaluate the clinical utility of using test kits for the diagnosis of a potential cardiac injury in bronchopneumonic calves as a tool to achieve early diagnosis to formulate prompt and appropriate therapy for diseased animals. The presented data clearly revealed that the field kit had 90% diagnostic accuracy and 87.5% diagnostic sensitivity with 67% specificity.

In the current investigation, the clinical settings in diseased calves were in agreement with those reported by **Al-Qudah** (**2009**) , **Ozkanlar et al**., (**2012**) **and Hanedan et al**., (**2015**). It was also evident that all diseased calves particularly those with chronic bronchopneumonia revealed elevation of pro-oxidant MDA level and decreased circulating levels of antioxidant levels including GSH and SOD while GPx activity was higher in acutely ill calves than controls and those with chronic infection. These findings went parallel to those obtained by **Alqudah**, **(2009).** The decreased levels of antioxidants SOD activity, GSH levels, and GPx activity in chronic pneumonic calves could be attributed either to the consumption of these enzymes to protect cells against oxidative injury via preventing initiation of the peroxidation process and production of final products such as TBARS (Thiobarbituric acid reactive substances) which are capable in inducing severe cellular damage (**Halliwell**,**1996**), or being a result of excessive production of radical species during the development of bronchopneumonia with a resultant exacerbation of oxidative damage in lungs as mentioned by **Alqudah (2009**) who added that the significant alteration of GPx, particularly in acute form of bronchopneumonia, can decreases the production of radical oxygen species until cellular amounts of the GSH would become insufficient for hydroperoxide reduction by GPX. Also our findings corresponding oxidative stress markers and antioxidants were also in harmony with those given by **Ledwozyw and Stolarczyk** (**1992**) and **Eleiwa et al.** (**2014**) in calves with bronchopneumonia.

In concern with variations in serum cTnI, The results revealed significant alterations in serum cTnI particularly in chronic calves compared with those of acutedisease. These

findings were in harmony with those reported by **Fraser** (**2013**); **Hanedan et al**. (**2015**) **and Aydogdu et al**. **(2016).**

The alterations of serum concentrations of cTnI in chronically ill animals were probably attributed to fibrosis of lung parenchyma with a resultant pulmonary hypertension and injury to the right side of heart (**Fraser**, **2013**). Similarly, the chronic respiratory diseases could resulted in right heart hypertrophy and cor pulmonale due to the increased work load to the right heart (**Angel et al**., **1992**). However, recent report had attributed the increase in the levels of cTnI to the myocardial damage in calves with respiratory distress syndrome (**Aydogdu et al**., **2016).**

In the present study, the concentration of cTnI was qualitatively determined in serum samples using rapid assay with a commercial kit. All animals with acute respiratory disease as well as all healthy ones were negative as indicated by appearance of only one line in the reading window (Photo1). In the contrast, 35 of 50 calves with chronic bronchopneumonia revealed positive results as indicated by appearance of 2 red brown lines appearing in the test window within 15-20 minutes. The color changes in positive cases varied from weak to strong (photo 2, 3). These obtained results were in part agreable with those reported by **Gunes et al**. **(2008).**

CONCLUSION

It could be concluded that the changes in proxidants and oxidative stress markers could be used as diagnostic markers for bronchopneumonia in calves as well as the quantitative and qualitative analysis of cTnI may be of value in diagnosis of myocardial cell damage in calves with chronic bovine respiratory disease. The qualitative cTnI rapid kit offers cheap, reliable and effective field method for determining the degree of cardiac injury as a result of chronic respiratory diseasein young calves.

REFERENCES

Al Qudah KM (2009). Oxidative stress in calves with acute or chronic bronchopneumonia. Revue. Med.Vet., 160 (5), 231 - 236.

Alpert JS, et al. 2000. Myocardial infarction redefined, Joint European Society of Cardiology American College of Cardiology: J.Am.Coll.Cardio., 36(3): 959, 2000.

Angel KL, Tyler JW (1992). Pulmonary hypertension and cardiac insufficiency in three cows with primary lung diseases. J Vet Intern Med Jul- Aug, 6(4): 214-9.

Aydogdu U, Yildiz R, Guzelebekets H, Coskun A, Sen I (2016). Cardiac biomarkers in premature calves with respiratory distress syndrome. Acta Veterinaria Hungarica 64 (1), pp.38-46.

Babuin L, Jaffe AS (2005). Troponin: the biomarker of choice for the detection of cardiac injury. C M A J, 173: 1191-1201.

Beutler E, Duron O, Kelly MB (1963). J. Lab. Clin.Med. 1963, 61, 882.

Eleiwa NZH, Gad GNA, El-Shorbagy A, I A (2014). Effect of a combined oxytetracycline HCL Flunixine meglumine therapy on undifferentiated respiratory disease in calves. International Journal of Advanced Research, Volume 2, Issue 3, 387-398.

Fraser BC (2013). Cardiorespiratory disease in holestein calves, M.V.Sc. Thesis Faculty of Veterinary Medicine, University of Kansas state, Manhattan, Kansas.

Gunes V, Atalan G, Citil M, Erdogan HM (2008). Use of cardiac troponin kits for the qualitative determination of myocardial cell damage due to traumatic reticuloperitonitis in cattle, The veterinary Record, april 19.

Halliwell B (1996). Antioxidants in human health and disease. Annual Review of Nutrition, 16, 33-50.

Hanedan B, Kirbas A, Dorman E, Timukan MO , Kandemir FM, Alkan O (2015): Acta veterinaria- Beogard, 65 (4), 454-42.

Hasic S Kiseliakovic E, Jadric R, et al. (2003). Cardiac Troponin I: The gold standard in acute myocardial infarction diagnosis. Bosn J Basic Med. Sci., 2003, 3: 41-44.

Kataria AK, Kataria N (2012). Evaluation of oxidative stress in sheep affected with peste des petits ruminants. J .Stress. Physiol. Biochem 8, 72-77.

Ledwozyw A, Stolarczyk H (1992). The involvement of polymorphonuclear leuco-cytes in the pathogenesis of bronchopneumonia in calves. VI. Superoxide dismutase and lipoprotein lipase activities. Acta Vet-erinaria Hungarica, 40, 267-277.

Lykkesfeldt J, Svendsen O (2007). Oxidants and antioxidants in disease: Oxidative stress in farm animals. Vet. J., 2007, 173, 502- 522.

Macnee W (2001). Oxidative stress and lung inflammatio in airways disease. Eur.J. pharmacol., 429, 195 - 207.

Mellanby RJ, Henry JP, Cash R, et al. (2009). Serum cardiac troponin I concentrations with cardiac and non cardiac disorders. JVet Intern Med, Jul Aug, 23(4): 926-30.

Nishikimi M, Roa NA and Yogi K (1972). Biochem. Bioph.Res.Common., 46, 849 - 854.

O'Brien PJ: PJ, Landt Y, Ladenson JH (1997). Differential reactivity of cardiac and skeletal muscle from various species in a cardiac troponin I immunoassay.Clin Chem (43) 2333-2338.

O'Brien PJ (2008). Cardiac troponin is the most effective translational safety biomarker for myocariac injury in cardiotoxicity. Toxicol, 245: 206-218.

Ohkawa H, Ohishi W, and Yagi K (1979). Anal. Bioche,, 95, 351.

Ozkanlar Y, Aktas MS, Kaynar O, Ozkanlar O, Kirecci E, Yildiz L (2012). Bovine respiratory disease in naturally infected calves: clinical signs, blood gases and cytokine response. Revue. Med.Vet., 163, 3, 123-130.

Paglia DE and Valentine WN (1967). J.Lab.Clin.Med. 70: 158-169.

Peek Sf, Apple FS, Murakami MA et al. (2008). Cardiac isoenzymes in healthy holestein calves and calves with experimentally induced endotoxemia. Can. J. Vet. Res. 4: 356-361.

Radostits OM, Gay CC, Blood DC and Hinchcliff KW (2000). A text book of Vet.Med.9th Ed. Baieller, Tindal and Cox.pp 1328-1329.

Radostits OM, Gay CC, Hinchcliff KW, and Houston DM (2007). Veterinary clinical examination and diagnosis, London, Philadelphia, New Yourk.

Serra M, Papakonstantinou S, Adamcova M, O Brien, Pj (2010). Veterinary ad toxicological applications for the detection of cardiac injury using cardiac troponi. Vet. J., 185: 50-57.

Sharma N, Singh NK, Singh OP, Pandey V, Vema PK (2011). Oxidative stress and antioxidant status during transition period in dairy cows. Asian-Aust. J. Anim. Sci. 24(4):479-484.

Soltesova H, Nagyova V,Tothova C, Nagy O (2015). Haematological and blood biochemical alterations associated with respiratory disease in calves. Acta.Vet.Brno,84, 249-256.

Tunca R, Sozmen M, Erdogan H, Citil M, Uzlu E, Ozen H., Gokee E (2008). Determination of cardiac troponin I in the blood and heart of calves with foot and mouth disease.J.Vet.Diagn Invest 20: 598-605.

Urban-Chmiel R, Grooms DL (2012). Prevention and control of bovine respiratory diseases, livestock Sci 3:27-36.

Varga A, Schober KE, Walker WL(2009a). Validation of a commercially available immunoassay for the measurement of bovine cardiac troponin I. J. Vet. Intern. Med. Mar- Apr, 23(2): 359-65.

Varga A, Schber KE, Holloman CH (2009b). Correlation of serum cardiac troponin I and myocardial damage in cattle with monensin toxicosis. J.Vet. Intern. Med. Sep- Oct, 23(5): 1108-16.

الملخص العربي

مغزي استخدام متغيرات اكلينيكيه وباثولوجيه مختاره في العجول المصابه بالالتهاب الشعبي الرئوي

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أجريت الدراسه الحاليه لتقييم استخدام أشرطه التروبونين القلبي الذي يتم قياسه نوعيا لتشخيص الإصابات القلبيه في العجول المصابه بالالتهاب الشعبي الرئوي وقد تم استخدام ١٢٠ من العجول البقري التي تعاني من الالتهاب الشعبي الرئوي الحاد والمزمن وتم تقسيمهم حسب الأعراض الإكلينيكية الي خمسين حاله تعاني من الالتهاب الشعبي الرئوي الحاد وخمسين حاله تعاني من الالتهاب الشعبي الرئوي المزمن كما أخذت عشرين حاله سليمة كمجموعة ضابطة .وقد تم قياس تركيزات التروبونين القلبي (I) كميا ونوعيا في سيرم الدم باستخدام الاليزا وباستخدام أشرطه الاختبار السريع للتروبونين وأيضا تم استخدام عينات من الدم لقياس المالون داي ألديهيد ونشاط انزيم الجلوتاثيون بيروكسيديز ومعدل الجلوتاثيون المختزل ونشاط انزيم السوبر ديسميوتيز وقد تبين من خلال الدراسه ما يلي :

بالنسبه لنتائج التحليل الكمي للتروبونين القلبي (I) فقد اظهرت النتائج ارتفاع ملحوظ في نسبه التروبونين في السيرم في العجول المصابه بالالتهاب الشعبي الرئوي المزمن مقارنه مع العجول السليمه ظاهريا والعجول المصابه بالالتهاب الشعبي الرئوي الحاد .

و بالنسبه لنتائج الاختبار السريع للتروبونين القلبي (I) الذي تم قياسه نوعيا في العجول عن طريق اشرطه بشريه جاهزه معده للاستخدام فقد اظهرت النتائج ان نسبه دقه الاختبار كانت 90% ونسبه حساسيه الاختبار كانت 87.5% ونسبه التخصصيه للاختبار كانت 67% بينما أظهر الاختبار أن القيمه التوقعيه للحالات الايجابيه 100% والقيمه التوقعيه للحالات السلبيه 67% كانت وبالنسبه لنتائج تحليل مؤشرات الاجهاد التأكسدي وتقييم مستوي الاكسده والانزيمات المضاده للاكسده فقد لوحظ وجود زياده معنويه في معدل انزيم المالون داي ألديهيد ألدهيد في العجول المريضه بالمقارنه مع الحيوانات السليمه ظاهريا وكان مقدارالارتفاع بدرجه اكبر في الحالات المزمنه للمرض عنها في الحالات الحاده وعلي النقيض فقد لوحظ وجود انخفاض في نشاط انزيم الجلوتاثيون المختزل وانزيم السوبراوكسيد ديسميوتيز في العجول المريضه مقارنه بالمجموعه الضابطه وكان مستوي الانخفاض في هذين الانزيمين بدرجه اكبروبنسبه ملحوظه في الحالات المزمنه عن الحالات الحاده اما بالنسبه لنشاط انزيم الجلوتاثيون بيروكسيديز فقد لوجود ارتفاع ملحوظ في مستوي نشاط الانزيم في الحالات الحاده للمرض بالمقارنه مع الحيوانات السليمه ظاهريا ومع الحالات المزمنه للمرض.

وقد خلصت الدراسه الي أن قياس مضادات الاكسده والمؤشرات الداله علي وجود الاجسام المؤكسده ذو اهميه كبيره في تشخيص الالتهاب الشعبي الرئوي في العجول بالاضافه الي امكانيه استخدام تحليل التروبونين القلبي الكمي والنوعي في تشخيص اصابه القلب المصاحبه للالتهاب الشعبي الرئوي في العجول.