Review article: The role of Tonsils in promoting infection

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Abstract

Tonsil microbial flora plays a distinct role in the process of infection. The relationship between the commensalism germs that live inside the living creature and the mechanism of development that causes illness is unknown. Most studies on the comparison of infected and non-infected tonsils based on certain polymicrobial and host factors. The germs share our biological systems from birth to death with the specificity of commensalism phenomena. Difference in flora retrieved from tonsil surface and core samples in diagnostic investigation promote to new understanding of infection mechanisms and causes of illness. This review article discusses the possibilities of infection existence by normal inhabitant biological agents.

Keywords: Tonsils, commensalism, Infection

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General Introduction on Germ Symbiosis

The germs (Microorganisms, Biological agents in nature) are spreadable in nature and surrounding the living creatures in which they have distinctive aspects to survive outside the host body, even if the circumstances are abnormal or inconvenient. The germs live on earth for at least 2.5 billion years. The reactions and interventions between the germs and hosts may be expressed as symbiosis, commensalism and pathogenicity. The symbiosis and commensalism are together in the term of Mutualism (Hooper et al. 2001).

The commensalism holds a wide range of germs by the host body, living in the skin, nose, pharynx, throat, guts, and genital tract. They are living with the host body without causing any disease symptoms as infections rarely happened (Lipsitch, 2001).

The relationship between the commensalism germs that live inside the living creature and the mechanism of development that causes illness is unknown. Understanding the initial reaction between the infectious microorganisms and their natural hosts will give us a farsightedness and perception that will lead us to put new plans to get rid of the infection permanently (Sim et al. 2000).

The germs share our biological system from birth to death. The body of living creature hosts a lot of sophisticated microorganisms in which their numbers exceed the numbers of body cells. The body host gains the commensalism germs (mainly bacteria) at the early stage of life after birth and continue within the body until death (Sim et al. 2000).

The relationship between the commensalism germs and their host bodies may be changed from commensalism to pathogenic in certain illnesses due to an improper stimulation to the immune system of the body and such stimulation is attributed to the lost of commensalism germs for tolerance.

The improper usage of antibiotics may set the body host to an opportunistic infection and then a fierce resistance to the antibiotics will arise, as well as the relationship between the commensalism and body hosts will be destroyed (Hooper et al. 2001).

The two palatine tonsils located on both sides of the upper pharynx serve several functions such as they participate in forming the antibodies against microorganisms enter in the body from the digestive and respiratory systems. They are functions as a filter to the breathing air, drinking water and food passing through nasopharynx. Due to their location and functions, they sheltered a lot of germs and considered to be one of the rare organs that stimulated by foreign invasions. They are therefore have shielded structure components different from the immune response incited by lymph nodes, spleen, thymus and bone marrow.

There are several complicated factors behind the evolution of an animal from being a carrier of pathogen to be a clear clinical case. Such factors may increase the virulence of the organisms. Other factors include environment, climate change, mismanagement, health care, malnutrition, congestion, and transportation that lead to stress, anguish and reduce resistance against diseases. This may lead to the possibility of transforming the microorganisms living normally in the upper respiratory tract, tonsils, and pharyngeal region to become pathogenic one (Radostits et al. 2008). The infectious agents like Respiratory Syncetia virus, parainfluenza virus (type 3) and Adeno Viruses, can spread to the upper respiratory tract and thus attributed to the high physical exertion and immunity depletion. These viruses defunct the mechanism of mucus by targeting the mucosa lining of the ciliated epithelial cells that are
producing mucus (Brogden et al. 1998). The mycoplasma infection causes bronchitis that defunct the mechanism of cleaning the respiratory tract to allow the microorganisms exist in the tonsils and pharyngeal area to settle down in the lower respiratory tract. The infection of hydatid cyst in sheep is considered to be one of the main factors to establish infection by residential bacteria (commensalism). It is well known that hydatid cyst is contains fluids that biologically attract bacteria and mycoplasma to the lower respiratory tracts (Alley & Clarke, 1977). The future researchers may try to explain the molecular basis of mutual benefits among the living creatures and highlight this complicated relationship among different species. It requires new point of views regarding the bio-chemical and genetic plans used by living organism with peers in order to live and adapted to each other’s needs (Hooper et al. 2001).

**Tonsils; structure and function**

**Anatomy:**

The tonsils are lympho-epithelial organs composed of lymphatic nodules accompanied by epithelial cells. Morphological anatomy of the tonsils is described as clusters of lymph nodes allocated under the epithelium at the entry of digestive and respiratory systems, and is separated from other tissues by the connective tissue capsule. The tonsils are covered by squamous epithelium which contains deep crypts called tonsillar fossulae and such crypts play a key role in allowing a high amount of lymphatic tissue in a specific area; as it is in the Ruminant tonsils (Nopajaroosri et al. 1971).

Thick unorganized connective tissue is partially covering the tonsils and extends small trabecule from the connective tissue capsule to the tonsillar lymphatic nodes. The blood vessels is penetrating the tonsillar capsule and ramified into capillary net, which spread out in the lymphoid tissue in the same way as it occurs in the lymphatic nodes. No afferent lymphatic’s found in tonsils. The lymphatic capillaries drained into the large size efferent lymphatic vessels that are existed in the tonsillar crypts (Abdul rahim, 1979). William and Linda (2000) described the tonsils as aggregation of lymphatic cells and the tonsils are existed in the connective tissue under the epithelium in specific areas of tongues, pharynx, larynx and follicular tonsils in which characterized with the presence of deep pits on the surface of epithelium called Crypts. The Crypt with associated lymphatic tissue is together representing the tonsillar follicle and is in turn collectively representing the tonsils. However, for example, a tonsils with crypt and Lingual tonsils in horses and cows as well as Paraepiglottic tonsils in sheep and goat and palatine tonsils are in horses and ruminants. The crypts lead to common sinus and this will eventually open on the surface. While tonsils without crypts are somehow containing of soft folds and cantilever or puffy surface but without deep invaginations from the epithelium (e.g. Tubal tonsils) in the ruminants and tonsils above epiglottis paraepiglottic tonsils in cats and palatine tonsils in herbivore animals. Gartner (1992) has indicated that palatine tonsils is a lymphatic gatherings allocated between the two bows of verbal palatine and Palatal pharyngeal and covered by Squamous epithelium that extends from it sheets to form crypts ,which in turn contain cell remains. The lymphatic nodules in tonsils are forming germinal centres representing secondary lymphatic nodes, in addition to the connective tissue capsule which cover the deep aspects of palatine tonsils. While the Pharyngeal Tonsils allocated in the lower part of nasopharyngeal wall and is covered by pseudo ciliated columnar epithelium in which contain of many folds. The tonsils
contain glands, in the deep part of connective tissue capsule, in which discharge its mucous excreted in the folds. The Lingual tonsils are covered by Squamous epithelium that form the deep crypts and this in turn contain of cell remains and the mucous glands channels usually opened at these crypts. Fawcett (1994) has mentioned that palatine tonsils allocated between the mouth and oropharynx, in which it is large oval aggregates of the lymphatic tissue under the mucosa and the Squamous epithelium covered the tonsils. The epithelial cells extended inside the lymphatic tissue forming 15 or more of tonsillar crypts and such crypts may be simple or branching which cover the tonsils with thick connective tissue represent the capsule. The lymphatic tissues of the tonsils are formed from lymphatic nodes right under the epithelium along the sides of crypts and in turn contain of prominent germinal centres, it is possible that the delicate connective tissue barriers expands from the capsule towards the inside and separate the masses of lymphatic tissue related to the crypts.

**Physiology:**
Tallat (1971) has indicated that tonsils at the normal healthy condition are acting as special immunobiological barrier, especially when producing antibodies that fit the antigens leading to impede function.
The tonsils have special structural components, plus their position at the entry of respiratory-digestive channel, which give the tonsil specialized cells best potential opportunity for the contact with antigens carried by the food or air at each swallowing movement that push the tonsils from their position or beds in the throat whereas their surface become the passage for the mouth and pharynx fluids; and in this way the lymphatic tissue is continually monitoring the various antigens enter with the air and food. Any antigens come with the air and food, enter the tonsils through free cell surface and immediately swallowed by the Reticuloendothelial cells. The tonsils are usually promoting their immune function for a certain period of time through which will gain a lot of information of the huge antibodies and provide the body with average number of memory cells as well as plasma cells and antibodies specialized for various kind of antigens. Rodriguez et al (1997) has mentioned in his study that the tonsils with the lymphatic nodes in the oropharynx are filtering the area from antigens. In this organ there are Follicular Dendritics cells which are net cells specialized in trapping and carrying the antigens by immune complexes on their surfaces. These Follicular Dendritics cells formed a three dimensional net with tiny cellular protrusion connected by links, these cells are not characteristic in many species and there are few marks which allow characterizing or distinguishing for these cells from the macrophages.
There are great similarity between the ruminant tonsils and human tonsils from the physiological and immune function but the lymphatic tissue is not completely developed in the first weeks of age which consist of few numbers of lymphatic cells and few germinal centres, within the period between (21-60) days the number of lymphatic cells will significantly increase in the tonsil epithelium (Manesse et al, 1998). It is believed that tonsils are producing lymphatic cells due to the presence of germinal centres accompanied by the increase of cell numbers which are sharing the production of immunoglobulin and antibody. Due to the contact of antigens to the epithelium of digestive and respiratory systems, the lymphatic cells stimulated or sensitized convey the immunity orders and forwarded to the
animal when reenter the connective tissue under the epithelium and following their migration to the lymphoid nodules and lymphatic nodes (Abdul rahim, 1979). The defensives of host body against the large numbers of commensal bacteria are not clearly understood. The synthesized immunoglobulin against the commensal bacteria was analyzed and found that it is not a natural antibody but always responded to the antigenic changes occurs in the commensally bacteria (Macpherson et al. 2000). The tonsils are lymphatic organs in which receive external stimulations from the mouth resources and the tonsillar crypts is covered by intact squamous tissue. In this respect, a theory called “Focus of infection theory” assumed that bacteria and viruses are eliciting a strong stimulation on the surface of the tonsils epithelium which are repeatedly suffering from abrasion and degeneration, as a result of that certain materials produced and sensitized the lymphatic cells in the tonsils to release antibodies in the blood. These antibodies will simultaneously affect other parts of the body. The tonsils lymphatic cells is characterized by its preference to strongly stick in the blood vasculature more than the peripheral lymphatic cells in blood and any damage happened to these vascular beds, believed to lead for certain changes and then infection occur. In certain circumstances, the tonsils play a key role as a Pathogenic foci when stimulation of lymphatic cells to liberate antibodies toward certain antigens and transferring information to the lymphatic system organs for production of antibodies. The ongoing researches are looking at these various agents in which leading to acute infections and pathological manifestations. In general, the mechanism of reaction is unclear until know (Micmillin et al. 1999).

The health importance of microorganisms harbouring tonsils:
The body of mammal animals contain a lot of commensalism organisms in which they perform a key role in the immunity function, plus wide ranges of the other host body activities, the current genetic revolution is now approaching to substantiate the cornerstones of these relationships, and so we can understand how the commensally organism participate in the normal functions? How can we make use of these germs in developing new medicines ((Hooper et al. 2001). Sheraz (1998) has indicated that the mouth area, throat and tonsils in the mammal animals in which contain of more than 100 bacterial species, and it is believed that the existence of such bacteria is normally participating in protecting the body against diseases either by producing lethal elements, such as antimicrobial and antifungal or devouring the nutrition and exhausting the oxygen. The continuous flow of saliva provide the whole region with antibodies type (IgA) and Peroxidise enzyme in which intervene with Thiocyanine ions in food, in addition of producing hydrogen peroxidise by commensally bacteria and Lysozyme as well as Lactoferrin in which organisms can take the necessary iron for their growth. There are also other proteins in the saliva inhibit the process of bacterial adherence on the surface of mucosa. The continuous change of the throat and oral epithelium lining has the main role in removing such organisms. The animal is normally carrying a lot of microorganisms without causing it any pathogenic effect or harm. Therefore, the balance between the commensalism and pathogenic status of microorganisms is still unclear in so many conditions, but suppose to perform a specific immunity function. Rebelatto et al. (2000) has conducted a histological study on the tonsils of sheep and mentioned that the tonsils are mucosal associated lymphoid tissue and due to their location at the entrance of pharynx, they
can breathe and digest the antigens, and they will simultaneously result in immunity response. He confirmed the significance of antigens intervention or exposure in the respiratory tract for the generation of immune response. Immunohistochemical study conducted by (Manesse et al.1998) on three (3) groups of sheep of different ages, found that tonsils and pharynx had an existed antigen at the area support the immune capacity of these animals after exerting effect on the localization of specialized cell. Rodriguez et al. (1997) had conducted an immunohistochemical study on the oropharyngeal area of goats, and found that the tonsils and lymph nodes contain FDCs cells and they are originally specialized reticular cells have the ability to capture antigens for a month or even years, and then it is necessary to possess an immunological memory. The intervention of (FDCS) cells, in the tonsils as well as pharyngeal lymph nodes to the antigens and staying there for a long time, is very necessary for the immunity system as well as increase the production of antibodies on the other hand (Al-Sultan.1998;1997;1995). Sheraz (1998) has mentioned that all bacteria existed normally as commensalism in the throat and tonsilar regions are available at certain numbers and the numerical size for each bacterium is continuously checked-up by the several defensive functions of the body host of mammal animals. The persistent existence of bacteria, in the tonsils, pharynx and upper part of respiratory tract, are stimulating the cell mediated immunity in the tonsil tissue (Waldman & Hennery, 1971-1972). Yudina (1961) had made a comparison study between the bacteria colonise the surface and the ones found in the deeper parts of tonsils, which revealed that the later one is more pathogenic as well as resistant to the antibiotics.

The commensal bacteria are adaptable in a convenient environment, where the body host avail nutritionally from it. This phenomenon gives an idea for the capability of using such bacteria as a therapeutic agent and this is what is called biological control, as the components of commensalism bacteria will be given as live biological supplement or probiotics. It is therefore avail the body host by giving some of these microorganisms in curing diseases. For human being, they use the non-pathogenic E.coli as a probiotics in curing the active ulcerative colitis disease. The modern experiments have been broadening in probiotics, as the bacteria are now genetically engineered to be used in the therapy plans of medicines, antibiotics and vaccines. For the human, the commensalism bacteria of St. gordonii has been genetically engineered to produce the antigenic determinant along with antibiotics characters in order to cure the vaginal infection caused by Candida albican in rodents (Hooper et al. 2001). The two researchers (Boyles and Denoon, 1995) had mentioned the capability of using the commensal bacteria in the recombination as new vaccines, the Gram positive commensal bacteria which are recombined will be safe stimulating the systemic and effective in and localized immune response.

The lived microbial vectors that grow fast and effectively on the mucous surfaces are more efficient than the killed vectors in stimulating the secretion of antigens that were recombined genetically but in most cases these lived microbial vectors include bacteria and viruses in which they are natural pathogenic factors for mammals that are engineered to reduce its pathogenicity and to promote a specific penetration as well as adherence in order to stimulate the immune response. The researchers had developed a system in compliance with non-pathogenic of Gram positive commensal bacteria in which established a convenient environment in the mucous for use to stimulate the immune response of mucosal surfaces
against the pathogenic agent that infect the mammals from certain sites, such as (vagina, guts and mouth). In general, the immunity response of commensal bacteria in the mammalian host is still unclear (Al-Sultan and Aitkin, 1984, 1985). The mammals produce antibodies in the mucous and serum after the colonization of certain commensal bacteria but these antibodies, for unknown reasons, does not remove these commensal bacteria. It is therefore expected that such microorganism will produce unified storage particles or elements on the surface and is treated in a similar manner, also produce in the development immune response to the recombinant antigens. The longstanding exposure of immune system to the recombinant antigens will be done either by the proliferations or the existence of balanced commensal bacteria in which recombination occurred after a single immune dose and this method could be effective and safe to overcome the need of repeating the antigenic dose. The stimulation of a localized systemic immune response in an area which is already infected by the pathogenic microorganism accompanied by a strong immune response which is a normal way and more effective to prevent the infection that start from the mucous surfaces.

**Bacterial colonization and inhabitancy in sheep tonsils**

The term of Commensalism came from the middle Latin ages (medieval era) which means (at table together) or the two partners living together with no harm to each others, and such relationship is still obscure to date. The relationship between them may change from commensalism to a pathogenic condition in certain cases, it happens when incorrect stimulation happened to the immune system of the host and such stimulation is related to the absence of tolerance of commensalism (Hooper et al. 2001) or in the modification and change in the micro environmental factors were bacteria reside within the ecosystem (Al-Sultan, 2008, 2006).

Some studies were conducted on the resident bacteria in the tonsils and upper respiratory tract. Through a field study by Gilmour et al., (1974), at the Scotland massacres, on the carriage of *P. haemolytica* (currently named in the new taxonomy as *Mannheimia haemolytica*) which is isolated from nasopharynx of adult sheep, (%64) isolated from the nasal mucosa while (%95) from the tonsils. It was noted that T biotype is the most common bacteria that exist in the tonsils (%65) of the total sheep, and (%6) in the nasal cavity. The moral of such findings indicate the existence of biotype T *P. haemolytica* in the tonsils of sheep are more than the naso-oral cavity. In Egypt, El-Sherif & Abd El-Ghani (1974) had isolated *Staphylococcus aureus* (%19.04), *Corynibacterium ovis* (%4.76), and *Streptococcus* (%4.76) as well as isolated the Gram negative bacteria like *E.coli* (%19.05), *Pasteurella* (%14.28) and *Pseudomonas aeruginosa* (%14.28) from sheep died due to the pneumonia and isolation of such bacteria from the apparently healthy animals in the tonsils and nasopharynx. Researchers like Al-Sultan and Aitken (1985), Al-Sultan (1999) and Al-Sultan and Al-Sadie (1998) attributed the *P. haemolytica* and *Neisseria Spp.* Alley et al. (1975) are the main cause for the sub acute and chronic conditions of Pneumonia in the New-Zealand sheep in which were isolated by high percentage (%59) and (%22) consecutively, whereas *S.aureus* and *E.coli* were at less percentage, and such bacteria were normally available in the nose, tonsils, and nasopharynx in the healthy or diseased animals. *P. haemolytica* can be isolated from nasopharyngeal mucosa as well as the tonsils of sheep that seems to be healthy; the treatment by antibiotics will reduce their numbers in the
nasopharynx and tonsils (Gilmour et al. 1982; Aitken and Al-Sultan, 1985). Scott and Jones (1998), found in a study on ewes with their lambs, *P. haemolytica* can be isolated from the tonsils of lambs and ewes as well as teats and skin of the udder. However, they could not isolate the bacterium from the ewe’s tonsils or skin of the udder during the antenatal period and after weaning. This proves that *P. haemolytica* was transmitted from lambs to their mothers. Briggs et al. (1998) conducted a study on sheep herd proves that *P. haemolytica* exist normally in the nasopharynx and tonsils, isolated by taking swab samples from these areas, such bacteria can transfer among the healthy sheep and other ruminants through the secretion of nasopharynx. The Study of Ward (1999) that had being conducted on sheep herd in which they do not suffer from any pathogenic condition confirm the isolation of *P. haemolytica* and *P. multocida* and considered it as commensal bacteria which exist normally in the upper respiratory tract, in the same time he concluded that these bacteria are severe potent pathogenic microbial agents in animals when they are exposed to stress, mismanagement, crowding, and transportation. Radostits et al. (2000) also had confirmed that *P. haemolytica* is the most common bacteria that exist in the tonsils as well as nasopharynx and developed pathogenic effect according to the immune status of the animal. Currently, the researchers are still trying to identify the flow of pathogenic processes that can occur due to the assumption that bacterial species which are less pathogenic; can eventually be more virulent.

Any swab samples taken from the tonsils and nasopharynx of mammalian animals may contain different types of bacteria such as *Neisseria spp*. It is important and critical to what it may cause a pathogenic condition e.g. *Haemophilus influenza*, *Streptococcus Spp.*, and *S. aureus* can be isolated from the aforesaid body locations even if the animal is clinically asymptomatic (Kisley et al. 1999). *Staphylococcus* exists normally on the skin, mucosa, and upper respiratory tract. There are two species *St. epidermidis* (non-pathogenic) and *S. aureus* (pathogenic). The *Staphylococcus has* two unique characteristics. Firstly, the nature of *mucous membrane* is hydrophobic in which ease the adherence of *Staphylococcus* on the cell surfaces. Secondly, following the formation of colonies, the bacteria will shield themselves with vital viscous membranes for the purpose of protection (Burkhart, 2001). Whilst Brock et al. (2001) categorized the *Streptococcus Spp.* as natural commensalism for the animals as well as humans to the following types:

a) First type is *Streptococcus Spp.* Isolated often on low profile as commensal and usually causes severe infections such as *Pneumococcus* and *Haemolytic streptococcus*.

b) Second type is intestinal of multiple shapes, found in the oral and upper respiratory tract, and represents part of the normal commensal bacterial flora in which is normally connected to the opportunistic infections.

*Klebsiella Spp.* Present in the upper respiratory tract and intestines (%15 - %10) in the healthy human and usually cause secondary bacterial infection for the people who suffer from chronic pneumonia (Davis et al. 1993; Bista et al. 2006).

**The Role of tonsil residential bacteria in the occurrence of respiratory Diseases:**
The genetic studies had put a crucial question, what makes the disease factor successful in the Pathogenicity? Such studies could clarify the mechanism in which these bacteria can cause the disease and infect the host as well as overcome the immunity system and excrete toxins in the body host. The evolutionary theory assumed that bacteria developed to a level of ferocity or virulence that enable them to transfer to another body host and this means the more risk of fatality or losing capability of the host, the less time required for the agent to transfer to another body host. These clarifications are difficult to synchronize with the nature’s life of pathogenic factors especially with commensalsisms bacteria that live by colonizing the body hosts in asymptotically way and may cause severe diseases when host natural barriers demolished then entering the blood stream, if the immune system of body hosts is shattered-down. The virulence of commensal bacteria is actually not connected to the transmission or the success of evolutionary process. Research of Day (2001) showed that bacteria may lose their capabilities of infection due to the mutation and restructure of DNA. They also mentioned by restructuring a locus of DNA, it may show type of less transmissible and invasive.

It is found that restructure of three out of seven loci of DNA is related to virulence lose. The assumption is toward the believe that virulence factors may allocated beside these loci. A full understanding of the epidemiology and infectious disease spread in which clearly depend on the genetic components of the causative agent is recommended to refer to the work of Lipsitch (2001). Multiple complicated factors have been indicated by (Radostits et al. 1997) in the occurrence of diseases or may stand behind the development condition of an animal carrier of etiologic agent to be a clear clinical case. The causative agent may increase the virulence, other factors such as environment and mismanagements play important role in the diseases occurrence. It affects the animal, in which reduce its resistance due to several and different effectors, collectively called the stresses that the animal is no more able to endure the ultimate and severe circumstances (Fraser et al. 1975).

The stress is either internal or external, chemical and physical effects that irritate nerve cells underneath thalamus to increase the secretion of Corticotropic releasing hormone at a higher average than at the same time of day in the absence of stimulus (Radostits el al. 1997). This increase will result in the increase of Adrenocorticals in which delay adherence of white blood cells to the vessel wall, it is therefore delayed their migration towards the inflammatory foci within vasculature and in the meantime affect the Chemotaxis process. This in turn inhibits the process of Phagocytoses plus affixing the Lysosomes that will keep the intercellular phagocytised agents inside the cells, also this process will delay the interaction with antigens and the weakness of immune level and function will allow the pathogenic microorganisms to adhere, colonize and invade the upper respiratory tract, Pharynx and tonsils to amplify the disease in the animal (Hagan & Brunner, 1981). While Carter (1973) has indicated that the climate changes play important role in the stress of animals. Al-Sultan (1978; 1976) and (Al-Sadi and Al-Sultan, 1980) has confirmed that climate, health care and management play a key role in the increase of respiratory diseases. Ikede (1978) has indicated the role of increase the load of stress in animals will convert the commensally bacteria living normally in the upper respiratory tract to be pathogenic and able to cause disease. This can be associated with weakness of the immune system. The malnutrition and weakness is an inhabitant factors to diseases resistance in which reduce the
immunity response against the causer agent (Hagan & Brunner, 1981). Brogdon et al. (1998) has mentioned that the infectious agents such as respiratory syncetia virus, adenoviruses and par influenza virus (type-3) are usually predispose to secondary bacterial infections that is living commensally at the upper respiratory tract due to the stress exerted on the immune system by the virus (Carter, 1973). Such viruses that inhibit the mucociliary transport mechanism through direct impact on the ciliated mucous secretory epithelial cells. The defunct of mucociliary movement mechanism by viruses will pave the way to the commensal bacteria normally non-pathogenic and available in the tonsils and pharynx at the ordinary health circumstances, to move to the lower respiratory tract. The viruses also facilitate the infection in the lungs by damaging the tiny respiratory bronchioles and the accumulated cellular debris are a convenient media for the secondary infection (Radostits et al. 1997).

In Iraq, Mahmoud and El-Janabi (1983) and AL-Sultan et al. (1987) had indicated that when the sheep were infected with hydatid cyst, this will pave the way for the secondary bacterial infections. It has been speculated that infection caused by commensally bacteria in the lower part of the respiratory system at the presence of hydatid cysts is due to the effect of bio-attraction contain of hydatid cyst fluids which act as vital stimulation for the bacterial mobility from tonsils and throat region to the lower respiratory tract (Al-Sultan and Al-Kennany.2000; Al-Sultan et al. 1991).

The Mycoplasma spp. is a cause of low grade bronchitis, this will lead to the disorder of cleansing and mechanical protection of respiratory tract, which allowed the commensal bacteria available in the oropharyngeal area to settle in the lower respiratory tract ending in bacterial pneumonia (Alley and Clarke, 1977). The Pulmonary infection of Mycoplasma is the main Predisposing factor for another infection with Pasteurella spp. (Sullivan et al. 1973; Al-Sultan and Al-Zubaidy, 1978). Jacques (1988) has mentioned that infections with Bordetella bronchiseptica are facilitating the colonization and adherence of P. multocida in which they become more virulent.

References


