THE BACTERIAL FLORA OF CANINE ANAL SACS

Thesis for the Degree of M. S.
MICHIGAN STATE UNIVERSITY
David Thomas Duncan
1958

THE BACTERIAL FLORA OF CANINE ANAL SACS

by

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A THESIS

Submitted to the College of Science and Arts Michigan State
University of Agriculture and Applied Science
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Division of Biological Science

1958

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ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to Dr. E. V. Morse for his guidance and aid. Sincere appreciation is also extended to Dr. R. G. Schirmer for his donation of the use of the animals in this study and for his many helpful suggestions. Many thanks, also, to Mr. John Drives for aid in obtaining the samples and the preparation of media.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES -- Continued

INTRODUCTION

Two well developed sac-like pouches, termed anal sacs are located on the lateral margin of the anal orifice of the dog. These structures were described anatomically as early as 1805 by Cuvier, and subsequently by many others. Their secretions have been analyzed as to chemical constituents by Hebrant (1899), Bruggeman and Rathsfeld (1937), and Montagna and Parks (1948). The pathological alterations associated with them have been cited and discussed by many authors (Saunders, 1910; McKenney, 1931; Coquot Bressow and Monet, 1933; Feldman, 1942; Brumley, 1943; and McCunn, 1953).

A questionnaire sent to veterinarians in five different sections of the country including the Lansing, Michigan, area, has shown that 60 to 100 percent of the dogs examined experienced some problem involving the anal sacs (Belding, 1957; Benson, 1957; Green, 1957; Grounds, 1957; Kirk, 1957; Peigh, 1957; McBride, 1957; Schirmer, 1957; Zeeb, 1957; and others). Techniques for rapid and safe removal of these structures have been developed by Theobald (1941), Wheat and Rhode (1951), and Blake (1954). The physiological importance of these sacs has been postulated by Hebrant (1899), and others.

To date, little information regarding the bacterial flora of these structures is available. For this reason, research was undertaken to determine the bacterial flora of the canine anal sacs. An attempt has been made to analyze the data in such a manner that it may indicate a change in the microbial population as influenced by

various factors. The effect of 12 antibiotics upon the sac flora was determined as part of the investigation.

LITERATURE REVIEW

There is a great deal of variation in the nomenclature of the many glandular elements in the canine anal region. The anal sacs have been termed by different authors, the anal pouches, the anal glands, the anal sacs, and the para-anal glands. The term anal sac will be used for the remainder of this thesis in accordance with a system of terminology proposed by Mladenowitsch (1907) and adopted by Ellenberger (1911).

The gross anatomy of the canine anal sacs has been described in detail by Hebrant (1899), Coquot, Bressow and Monet (1933), Montagna and Parks (1948), and Neilsen (1953). These sacs are bilateral organs from a hazel nut to a walnut in size situated lateroventrally to the anus. They lie between the external sphincter muscle of the anus and the longitudinal muscle of the rectum (Bradley, 1943) and between the white internal and red external sphincters of the anus (Montagna and Parks, 1948; Neilsen, 1953). They are pouch-like and form a passive reservoir into which apocrine and sebaceous glands open. Each sac opens ventrally on the lateral margin of the anus by a single duct which is approximately 3/16 inches from the anal orifice (Kirk, 1953). They are considered by Neilsen (1953) as nothing more than sacculations of the skin forming a passive reservoir and excretory duct for the complex of glandular tissue comprising the true parenchyma of the organ.

Cornified stratified squamous epithelium lines the sac and its duct. Subadjacent to this lies a thick mantle of glandular tissue

embedded in a connective tissue stroma. This stroma is rich in diffuse lymphatic tissue and, some lymphatic nodules may be present. Coiled apocrine sudoriferous tubules are found surrounding the fundus of the sac and communicating with its lumen. In addition to the apocrine glands, large sebaceous acini are also present.

In general the sebaceous glands are found close to the neck of the anal sac and the apocrine glands are concentrated in the fundus. Morphologically, it is difficult to distinguish the sudoriferous and the sebaceous glands of the sac from the corresponding cutaneous glands. The former are present in larger numbers, and the individual glands seem larger than the glands of the skin (Montagna and Parks, 1948).

Simple columnar epithelium lines the highly convoluted sudoriferous tubules. Spirally arranged elongated myoid cells form a wall between the columnar cells and the prominent basement membrane of a tubule. The myoid cells seem to fit together like barrel staves when observed in a longitudinal section. They are very similar to smooth muscle fibers. Some of the tubules are lined by tall columnar cells whose apices are often frayed and protrude into the lumen, giving the appearance of a smaller lumen. The epithelium may also be of the low columnar or cuboidal type. These types give the tubules the appearance of being greatly dilated.

In the apices of the tall columnar cells, argyrophilic granules are revealed in abundant quantities when tissues are prepared by the DeFano method (Montagna and Parks, 1948). In the low columnar cells, there is a sparse distribution of granules. The

entire cytoplasm of some tall columnar cells is highly argyrophilic while morphologically similar adjacent cells show only discrete blackened granules.

In the low columnar cells, the Golgi apparatus is a flattened filamentous mass. Generally it encircles the distal half or third of the nucleus but may occasionally encircle it completely or lie at one side. It is as large or larger than the nucleus of the tall columnar cells, especially those with frayed outer surfaces situated in the apical cytoplasm. In rare cases, filamentous strands may descend along the sides of the nucleus toward the proximal pole of the cell (Montagna and Parks, 1948).

The mitochondria of the columnar cells are situated in the supranuclear cytoplasm but occasionally, they may encircle the nucleus completely. They are usually in the form of rounded bodies arranged to reveal a definite axial polarity of the cells. The mitochondria are found to be abundant throughout the apical cytoplasm in the tall columnar cells, but are restricted to a narrow supra-nuclear band in the low columnar cells. The apically frayed cells are heavily laden with mitochondria in their distal cytoplasm. This would suggest that these are the most active cells metabolically (Montagna and Parks, 1948).

The lumen of the apocrine tubules appears to contain a slightly acidophilic, colloidal material. Numerous vacuoles appear at the periphery where the tall columnar cells are in contact with the colloid. These vacuoles seem similar to the chromophobic secretion droplets of the type found in the thyroid gland follicle (Montagna and Parks, 1948).

According to Montagna and Parks (1948), the anal sacs are filled with a viscid, malodorous, acidic secretion. Coquot, Bressow and Monet (1933) describe the normal secretion as a cloudy liquid, grayish white, "gooey," or viscuous, to a pasty, gray-brown material. Hoare (1915) described the normal secretions as brown, butter-like in consistency and acid in reaction, composed chiefly of fatty material with an offensive odor. Hebrant (1899) stated that the secretion contains cholesterol and leucine and ascribes the characteristic odor and acidity of the sacs to "fermentation" which results in the production of butyric acid, skatoles and indoles. He found the ash residue of the secretion to contain abundant amounts of calcium, sodium and potassium.

Bruggemann and Rathsfeld (1937) indicated that the secretion of the anal sacs was made up of approximately 87.8 percent water and 12.2 percent drystuff. The drystuff was in turn made up of 96 percent organic matter and 4 percent inorganic matter. The lipid fraction comprised 13.2 percent of the organic drystuff and was found to contain 2.21 percent cholesterol and variable amounts of phospholipids. The inorganic ash contained 11 percent total phosphorous. Montagna and Parks (1948) stated that there exists within the glandular complex of the anal sacs some neutral fats, cholesterol, lipine and plasmal as well as Fischler-positive substances, which may be fatty acids. These workers found that two types of glands are responsible for the secretion of these substances. They are the sebaceous glands located in the dermis of the excretory ducts of the sacs and the apocrine tubules located within the sacs. The apocrine tubules are very

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numerous, of a serous nature, and probably secrete the water-like component which makes up the greatest part of the secretion. The apocrine cells of the glands of the anal sac also contain lipid droplets which Montagna and Parks (1948) indicate are not stained with sudan III and sudan IV, but do stain with sudan black. This is true even after the secretions have been immersed in lipid solvents. The Baker acid-hematein and Smith-Dietrich tests indicate that these liquid droplets may be lipines (Baker, 1946; Montagna and Parks, 1948). There is no cholesterol or neutral fat in these columnar cells even though granules stainable by the Fischler technique are found. These granules may be fatty acids according to Montagna and Parks (1948). These workers also believed that the tall apocrine cells are responsible for the mineral salts that appear in the ash residue of the anal sac secretions. These salts include potassium, calcium and sodium.

Since ribonuclease abolishes the cytoplasmic basophilia of the columnar cells of the apocrine tubules of the anal sac, it was believed that this cytoplasmic basophilia represents ribonucleic acid (Montagna and Parks, 1948).

The sebaceous glands were believed to be responsible for the remaining lipids found in the anal sac secretions, and contribute the bulk of these substances. This would include cholesterol esters which are abundant, as are unsaturated glycerides, Fischler-positive substances, plasmal and lipine. All of these substances appear in the sebum of the sebaceous glands.

Within the myoid cells and the basement membrane of the apocrine tubules alkaline phosphatase is abundant. The sebaceous glands and sebum of the excretory ducts contain moderate amounts of

alkaline phosphatase while the epithelial cells contain only small amounts of this enzyme. Acid phosphatase was localized only in the apical cytoplasm of the active apocrine cells in large quantities according to Montagna and Parks (1948).

The biological significance of the combined secretion of the tubules of the anal sac and the sebaceous glands associated with the anal sac's excretory duct are unknown. Hebrant (1899) and Smith (1940), along with many others, believed that the anal sac secretions may serve to aid in the passage of feces and to protect the anal area. Bradley (1943) stated that the anal sacs are located adjacent to the sphincter ani internis whose action is to asist the ani externis. These two muscles are responsible for the lifting of the dog's tail, the closing of the anus, the constriction of the anal sacs, the retraction of the penis, and the compressing of the vagina. As defecation occurs, firm feces distend the rectum and anal orifice. At the same time, the muscles mentioned above are in a state of semi-contraction. This results in the discharge of the contents of the sacs through their ducts onto the anal orifice.

It was postulated that the anal sac secretions coated the feces thereby making defecations easier (Hebrant, 1899; Smith, 1940). Another function of these secretions may be to form a protective layer between the tissues of the area, and the irritating materials present in the feces (Hebrant, 1899). These workers correlated the ideas mentioned above with the fact that there are similar glands to those of the anal sacs elsewhere in the body and that in these cases the function of the glands is local. Montagna and Parks (1948) did not hold these views because the openings of the ducts of the

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anal sacs are at the very margin of the anus. This they felt would result in very little actual lubrication or coating.

Another function proposed was that the anal sacs have an errotic role (Hebrant, 1899; Hoare, 1915; Coquot, Bressow and Monet, 1933; Knappenberger, 1940; McCunn, 1953). It was felt by these workers that the secretions of the sacs have an odor which is attractive to the opposite sex and is individually specific for each animal. The secretions may serve as a means of identification and stimulation during the time of heat. This has been referred to as the "spoor" of the dog by McCunn (1953).

Comparative anatomists favor a third theory. In the skunk, sacs comparable with those of the dog, contain a pungent odorous secretion which this animal uses for protection (Theobald, 1941). This lends to the possibility that the anal sacs of the dog may have been designed for this same purpose but through lack of use, the muscles that enable voluntary discharge of the sac contents have been lost or are vestigial (McBride, 1957).

It may be proven in the future that any one or all of the theories that have been proposed to explain the biologic significance and physiological role of the anal sacs of the dog are correct. A new theory for anal sac existence in the dog may evolve and hence none of the present theories may be valid.

Veterinarians are well aware of the various types of involvements and pathological disturbances that occur in and around the anal sacs of dogs. Hebrant (1899) describes inflamed anal sacs as warm, painful, fluctuating swellings, which sometimes give rise to frequent

and violent efforts at defecation. The ability to express pus from these structures and the fact that they sometimes become ulcerated has been well established (Hebrant, 1899, 1910; Saunders, 1915; Hoare, 1915; and others). The inflammation or irritation that develops is believed to cause the animal to chase its tail, lick its anus, or drag its rear quarters on the ground or floor. Many workers believe that these actions are either an attempt to evacuate the sacs, an attempt to bring relief from the irritation, or both (Saunders, 1915; Hoare, 1915; Coquot, Bressow and Monet, 1933; Knappenberger, 1939; McClelland, 1942; Brumley, 1943; Lacroix, 1947; McCunn, 1953).

Disease of the anal sacs is reported to be especially common in dogs confined to the house as pets as opposed to those living in the oper, i.e., on a farm, etc., according to Hoare (1915), Saunders (1915), and others. This is believed to be due chiefly to the diet and to a lack of exercise. A diet which lacks the necessary material to make feces firm or hard enough to bring about the discharge of the anal sacs of their contents serves as an example (Hoare, 1915; McCunn, 1953; McBride, 1957). This is also true of dogs denied sexual intercourse and those suffering from senile changes (Hoare, 1915; Saunders, 1915). Other causes of anal sac difficulties are helminthiasis, proctitis, and retention of the anal sac secretion which "ferments" in the sac (Coquot, Bressow and Monet, 1933). The secreting membrane often becomes inflamed and irritated from constipation, foreign bodies, and infections, all of which may change the character of the secretion to a thicker mass which partially or completely occludes the anal sac ducts according to Brumley (1943). This results in the retention of

the secretions of the glands of the sac and their subsequent swelling and redness. In some cases, an increase in the secretion may result in an accumulation of the discharge on the hairs and margin of the anus thus setting up an irritation of the entire anal area.

The Merck Veterinary Manual (1955) states that the retention of the material in the sacs sets up an inflammation and irritation, and this the dog attempts to relieve. A retention cyst is sometimes formed when soft feces fail to stimulate discharge of the gland completely. The soft feces may then occlude the outside of the duct while the glandular secretions produce internal occlusion (McCunn, 1953). Since the openings of the ducts of the sacs are directed upward, it is possible for fecal material to be forced in and act as a foreign body. In this case, the glands act as "natural incubators" (Smith, 1940). McBride (1953) stated that in puppies, one or both of the anal sacs frequently become occluded, however infection is rare. It is possible that a thickening of the secretion and/or granules formed in the secretion occurs causing the occlusion of the ducts by making it difficult for the secretion to be forced out. In older dogs, occlusion or impaction may result from obesity, lack of exercise, and/or lack of muscle tone (Hoare, 1915; Saunders, 1915; McCunn, 1953). In such cases the secretion remains within the sac and becomes hard. This hard material acts as a foreign body. Infection may then become established and complications result (Runnells, 1954).

Acute infection of the anal sacs is common. This may in turn extend to the surrounding tissue and result in abscess formation and chronic infection (McBride, 1953). These factors predispose the

wall of the sac to infection, and with infection, the wall of the sac may rupture (Theobald, 1941). Lacroix (1941) warned that unless the owner of the animal is observant and concerned with the dog's welfare, the abscesses may rupture spontaneously, heal, and again rupture with the ultimate formation of fistulus tracts. The reaction on the part of the dog to relieve the discomfort probably aids in this rupture. With the development of an opening to the outside, organisms that were originally limited to the outer surface of the skin can now infect the underlying tissue, thereby bringing about a deeper and more acute irritation. Once the abscess is broken the organisms present may be capable of establishing new foci of infection elsewhere in the body (Hirshman, 1931; Smith, 1940; Zepp, 1945; McBride, 1953).

Proctitis, and inflammation of the rectum, may in many cases have an origin in pathologic conditions of the anal sacs (Theobald, 1941). Infected anal sacs have also been linked to pruritis ani and various adenomas (Hoare, 1915; Feldman, 1932; Knappenberger, 1939; Theobald, 1941, 1942; McClelland, 1942). If infection involves the crypts of Morganii, the ensuing conditions of cryptitis, ulcers, fissures, abscesses or fistulas may occur (McKenney, 1931).

To further increase the scope of difficulties of anal sac origin, the severe constipation that often occurs may cause an absorption of toxins from the digestive tract as well as from the foci of infection. Convulsions, lameness, paraplegia, neuritis, auto-intoxication, and muscular pain may develop (Smith, 1940). Zepp (1945), Biejers (1954), Visintine (1954), and others indicated that

the anal sacs, due to the bacterial flora, may serve as a source of origin for certain types of dermatitis, i.e., acne, furunculosis, inter-digital infectious eczema, eczema of the anus and surrounding parts, acanthosis nigricans, and similar conditions. Because of these facts, the cause of these ailments must be determined and corrected at the origin and preventive measures taken if a permanent cure is to be effected (Zepp, 1945).

MATERIALS AND METHODS

The dogs for this study were obtained through the courtesy of Dr. R. G. Schirmer of the College of Veterinary Medicine, Michigan State University. The equipment used for the collection of each of the samples consisted of a sterile 5 cc syringe and a blunt, 1½-inch, 18-gauge needle. Sterile 0.85 percent sodium chloride solution (saline) was also available. Sterilization of these materials was accomplished by autoclaving at a temperature of 121° C. at 15 lbs. pressure for 45 minutes. The following information pertaining to each dog was obtained: owner's name, breed, identification number, age, sex, and the preliminary diagnosis or reason for hospitalization. After the sample was obtained, the color of the anal sac secretion was noted.

A general anaesthetic, Surital (Parke, Davis and Company), was administered to relax the muscles of the anal area. One attendant held the tail in an elevated position, and the anal area was swabbed with 1:1000 Nolvasan (Parke, Davis and Company), an antiseptic solution. Using sterile technique, the blunt needle was inserted into the anal sac. Extreme care was employed in this operation to be sure that the needle did not touch any of the adjoining tissue and thereby produce a contaminated sample. Once the needle was well within the sac, aspiration of the sac contents was effected. By this technique it was possible to obtain material for bacteriological examination, even when secretions were hard or of a waxy

consistency. Approximately 1 cc of the secretion was mixed with 1 ml of the sterile saline. The samples were then taken to the laboratory for culture using the various selective and differential media. The interval from the time of collection to the time of plating on media varied from 30 to 60 minutes.

All culture media used in this study were obtained from the Difco Laboratories, Detroit, Michigan. Sterile defibrinated bovine blood, to give a final concentration of 5 percent, was used in all the blood agar media. One 5 mm loop-full of the saline-secretion suspension was streaked over 2 eosin methylene blue agar plates (EMB), 2 aside blood agar plates, and 2 blood agar plates. Three 5 mm loops of the saline suspension were inoculated into 1 tube of ethyl violet azide broth (EVA). The remaining amount of the sample was poured into 10 cc of selenite broth. One of each set of plates was incubated aerobically, while the other plate was incubated anaerobically at 37° C. In this manner isolations of both aerobic and anaerobic organisms was possible. Eosin methylene blue agar was chosen because it is recommended as a differential plating medium for the detection and isolation of gram negative intestinal bacteria and at the same time gives a sensitive accurate and stable differentiation between the fecal and non-fecal types of the colon-aerogenes group (Holt-Harris and Teague, 1916; Levine, 1918). Blood agar is recommended as being distinctly advantageous for culturing pneumococci, streptococci, and staphylococci. At pH 6.8, very clear zones of ehmolysis are evident and the hemolytic characteristics of colonies are readily discernible. Azide blood agar is recommended as the medium of choice for the isolation of

streptococci from stools, sewage, and other materials (Snyder and Lichstein, 1940; Mallmann, Boatwright and Churchill, 1941; Lichstein and Snyder, 1941). Sodium azide was first used by Hartman (1937), to suppress the growth of gram negative bacteria while allowing the growth of streptococci. Azide blood agar is also recommended for the isolation of staphylococci. A selective medium containing ethyl violet and sodium azide is recommended as specific for the growth of enterococci (Litsky, Mallmann and Fifield, 1953). The ethyl violet inhibits the growth of gram positive bacteria with the exception of the enterococci at a concentration of 0.00083 grams per liter, while the sodium azide at a concentration of 0.4 grams per liter inhibits the growth of gram negative bacteria. Ethyl violet azide broth was used as an isolation and confirmatory medium to demonstrate the presence of enterococci.

Selenite broth is recommended as an enrichment medium for the isolation of various intestinal pathogens (Leifson, 1936). Sodium selenite possesses properties which have a differential inhibiting effect on the growth of various microorganisms. The isolation of intestinal pathogens of the Salmonella group from feces, urine, and infected tissues, is facilitated by the use of media containing this chemical (Leifson, 1936).

Following incubation for 24 and 48 hours, plates of the media were examined. Gram stains were made from isolated colonies. The colonies obtained from the eosin methylene blue agar plates were of four types. The typical Escherichia coli type and the typical Aerobacter aerogenes type (Levine, 1918), the atypical coli-aerogenes

type, and a fourth type which had the characteristics of the genus Proteus. If the colonial morphology was similar to that of E. coli, Aerobacter, or not typical of either and yet was composed of gram negative rods, but was not of the Proteus type, the "I. M. Vi. C." tests were conducted (Dubos, 1952). If the results of the "I. M. Vi. C." test indicated that the colony isolated was E. coli, this evidence was considered sufficient. If the organism isolated gave a positive reaction for the Aerobacter group, it was further determined whether the species was A. aerogenes or A. cloaceae.[1] If the colonial morphology was similar to that of Proteus, a subculture was made on a urea agar slant. A red butt and slant were indicative of active hydrolysis and probably indicated a member of the Proteus group (Stuart, Van Stratum and Rustigian, 1945; Christensen, 1946). All cultures believed to be Proteus were subcultured on tryptose agar slants until further identification was possible. If the colonies were gram negative rods and did not prove to be Escherichia, Aerobacter, or Proteus, they were likewise cultured on tryptose agar. If the culture was mixed, it was suspended in a drop of sterile saline and restreaked over an E.M.B. plate.

The selenite broth tube was incubated for 6 hours and three loopfulls were then streaked on a Salmonella-Shigella agar plate. Salmonella-Shigella agar is recommended as a selective medium for the isolation of Salmonella and Shigella from feces and other materials. (Hardy, 1942; Rose, 1942) Three types of colonies are

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[1] The ability to liquefy gelatin is sometimes very slow (Breed, Murray and Hitchens, 1948), and sometimes lost by Aerobacter cloaceae (Kligler, 1914). For this reason, the genus Aerobacter is used in this thesis instead of the genus species.

to be found. One type is small, opaque, and slightly raised. The second is similar to the first, but with a small black center, while the third type is large, raised and almost completely black. All three colonial types were subcultured on urea agar slants. Cultures which within 6 hours had developed red butts and slants were considered to be of the genus Proteus (Stuart, Van Stratum and Rustigian, 1945; Christensen, 1944). Colonies which were urease negative were to have been cultured on Kligler's medium as well as the differential sugar broths. Cultures which resembled Salmonella or Shigella were to have been sent to the Michigan State Department of Health Laboratories, Lansing, Michigan, for serological confirmation. Gram negative organisms obtained from blood agar were suspended in sterile saline and subcultured on an E.M.B. plate. Confirmatory tests included the same procedures described above. All Proteus type cultures were subcultured on a urea agar slant and if shown to be urease positive were transferred to tryptose agar slants and held for further classification. The classification of the Proteus group entailed the transfer of pure cultures to mannitol, sucrose, maltose, and indole broths (Breed, Murray and Hitchens, 1948).

All gram positive cultures obtained from azide blood agar and ethyl violet azide broth (E.V.A.) were transferred to blood agar plates for further identification. Colonies of gram positive cocci which gave the colonial morphology and gram stain appearance of staphylococci were cultured on Staphylococcus Medium 110 (Chapman, 1946). This medium is selective for staphylococci due to its high sodium chloride concentration, and is well suited for pigment

production (Chapman, 1946). Colonial morphology, pigment production, ability to liquefy, gelatin, utilize $NH_4H_2PO_4$, ferment mannitol, and coagulate blood plasma were further used to classify the staphylococci (Breed, Murray and Hitchens, 1948). Those blood agar colonies believed to be streptococci on the basis of their colony morphology, gram stain, and growth in ethyl violet azide broth were further examined. The characteristics used to classify and differentiate members of the genus Streptococcus were colonial morphology, Gram stain, hemolytic activity, ability to grow in nutrient broth containing 6.5 percent sodium chloride, liquefication of gelatin, ability to grow in E.V.A. broth, and mannitol fermentation (Breed, Murray and Hitchens, 1948; Dubos, 1952; Litsky, Mallmann and Fifield, 1953).

An additional study dealt with the inhibiting effect of antibiotics upon anal sac microorganisms in vitro. Discs of the following antibiotics and their relative concentrations are listed in Table 31.

The antibiotic sensitivity discs were obtained from Baltimore Biological Laboratories, Baltimore, Maryland.

Twenty-one of the 125 samples of the anal sac secretions were examined as to the complete aerobic flora sensitivity to antibiotics. Two blood agar plates were inoculated with 5 loopfulls of each sample. Antibiotics were arranged on a plate approximately equidistant from each other, the center, and the edge of the plate. These plates were incubated at 37° C and were examined at 12, 24, 36, and 48-hour intervals. At each examination, the zone of inhibition was measured around each disc. The approximate inhibition ratings were as follows: + indicated that the zone of inhibition around the disc

had a radius of 3 to 6 mm; ++ referred to a zone of inhibition from the disc of from 6 to 9 mm; +++ indicated an almost complete lack of colonies in an area of from 9 to 12 mm; ++++ indicated a complete elimination of colonies from 12 mm or more radius.

RESULTS

There were 125 dogs used in this study. The organisms isolated from each of these dogs are listed in Table I. The identification number, age, sex, color of the secretion, and reasons for clinic admittance of each of the dogs is listed in Table II. The cultures isolated included gamma, alpha, and beta hemolytic enteric streptococci, Staphylococcus albus, Staphylococcus epidermidis, Escherichia coli, Aerobacter, Proteus morganii, Pseudomonas aeruginosa, and some unidentified yeasts.

The data obtained were analyzed for the incidence of each of the organisms isolated from the anal sacs. Enteric streptococci were isolated from 77.6 percent of the 125 dogs examined. Nonhemolytic enteric streptococci were isolated from 69.6 percent, alpha hemolytic enteric streptococci from 4.9 percent, and beta hemolytic enteric streptococci from 15.2 percent. The streptococci isolated were Streptococcus liquifaciens, and Streptococcus zymogenes. Table III gives the physiological reactions of the streptococci isolated and the sample numbers in which they were found.

Coliform organisms were found in 93.6 percent of the dogs. Escherichia coli was found in 80.0 percent, while Aerobacter was isolated from 58.8 percent. The criteria for identification of E. coli are summarized in Table IV and for Aerobacter in Table V. Proteus was isolated from 72.0 percent of the dogs. The species' characteristics are summarized in Table VI. All of the Proteus

cultures were found to be Proteus morganii. Pseudomonas aeruginosa was obtained in 7.2 percent of the dogs. The identification of this species is summarized in Table VII.

Staphylococci were found in 12.0 percent of the cases. Staphylococcus albus represented 8.8 percent and Staphylococcus epidermidis comprised 3.3 percent. The identification reactions for the staphylococci are summarized in Table VIII. Yeasts were obtained from 28.0 percent of the dogs. No attempts were made to identify the yeasts as to genus or species. Figure 1 compares the respective percentages of each of the organisms isolated.

Of the dogs examined, there were 44 females, 80 males, and one dog in which the sex was not recorded. The incidence of the organisms occurring in the females is found in Table IX, and for the males in Table X. Figure 2 compares the incidence of the respective organisms with the sex of the dogs.

The secretions obtained from the anal sacs were of four color types: 1) white to light gray, 2) medium brown to dark brown, 3) medium green to dark green, and 4) medium gray to dark gray. The white to light gray occurred in 57.6 percent of the dogs, the brown was found in 12.8 percent, the green occurred in 8.0 percent, and the darker gray in 21.6 percent. Figure 3 summarizes the distribution of color types and their respective occurrence, while Tables XI through XIV correlate the predominant microorganism with the color group.

The breed of dog was grouped according to the American Kennel Club (A.K.C.) classification, and tabulations were made comparing

these groups with the organisms isolated. Of the dogs examined, 16.9 percent were of the hound class, 37.1 percent were of the sporting class, 27.4 percent were of the working class, 6.5 percent were of the non-sporting class, and 4.0 percent were of the terrier class. There were 8.1 percent mongrels. Figure 4 gives the incidence in which the dogs used in this study occurred in each of the different A.K.C. classification groups. Tables XV through XX summarize the correlation of the A.K.C. classification of breeds with the microorganisms isolated. Figure 5 is a summary of Tables XV to XX.

There were 120 of the 125 dogs for which the ages were available. The different age groups are indicated in Figure 6. Tables XXI through XXX summarize the relationship of age of dogs to microorganisms isolated.

Table XXXI shows the data obtained from the antibiotic sensitivity studies. Sensitivity determinations for the microbial flora of the various samples are listed in Table XXXII. Figure 7 summarized the inhibitory effect of the 12 antibiotics used. Dihydrostreptomycin, chloromycetin, and neomycin appear to be most effective in inhibiting the organisms from the anal sacs.

DISCUSSION

The bacterial flora of 125 canine anal sacs has been found to include Escherichia coli, Streptococcus liquefaciens, Streptococcus zymogenes, Proetus morganii, Aerobacter aerogenes, Staphylococcus albus, Staphylococcus epidermidis, Pseudomonas aeruginosa, and unidentified yeasts. These organisms have been divided into ten groups and compared with the following data: 1) the sex of the dog, 2) the age of the dog, 3) the color of the secretion obtained from the anal sac, and 4) the type classification of the dog as recommended by the American Kennel Club. The 10 groups of microorganisms were: nonhemolytic enteric streptococci, alpha hemolytic enteric streptococci, beta hemolytic enteric streptococci, S. albus, S. epidermidis, E. coli, Aerobacter, P. morganii, P. aeruginosa, and yeasts. It was felt that subdividing the streptococci according to hemolytic activity would serve as a more practical means by which a clinician might estimate part of the flora of the sacs if any trends were observable.

The comparison of the 10 organism groups with the sex of the dogs is listed in Tables IX and X, and summarized in Figure 2. There were 80 males and 24 females. In males the frequency of Proteus, was 18 percent greater than for females. Aerobacter was observed 10 percent more frequently in males than in the females. E. coli showed a 15 percent greater incidence in the females than in the males.

The American Kennel Club (A.K.C.) recommendations for groupings of the breeds of the dogs was compared with the microorganisms isolated. The data are listed in Tables XV through XX. The A.K.C. groupings included the hounds, sporting dogs, non-sporting dogs, the working type, and the terriers. A few mongrels were also present and these constituted an additional category. There were 124 animals whose breeds were known. The percent of each group for each organism isolated is summarized in Figure 5. The occurrence of the organisms isolated from each A.K.C. group is summarized in Figure 4. Although McBride (1957) suggests the possibility that screw tailed dogs may have a predisposition for inflammation and infection of the sac due to the unhygienic conditions around the tail, the evidence does not support this assumption. No specific trends are observable from the A.K.C. classification comparisons.

The comparison of the color of the secretions obtained from the anal sacs with the microorganisms isolated is listed in Tables XI through XIV. Four colors were observed, i.e., a gray-white, a brown, a green, and a darker gray. Figure 3 compares and summarizes the occurrence of the microorganisms isolated with the colors of the secretions. The gray-white colored secretions exhibited no specific trends. The green colored secretions indicated a higher incidence of alpha hemolytic enteric streptococci and Pseudomonas than did any of the other secretion types. In the brown colored secretions, Staphylococcus albus was predominant and Pseudomonas sp. was not uncommon. E. coli and Proteus occurred most frequently in the gray colored secretions. Although these trends are evident, many more

samples would be necessary before these facts could be considered to have statistical validity. It is still not plausible to predict unequivocally the anal sac flora from the color of the secretion.

A comparison of the incidence of the microorganisms isolated and the ages of the dogs studied is listed in Tables XXI through XXX. Gamma hemolytic enteric streptococci were most often encountered in dogs one and ten years old. Alpha hemolytic enteric streptococci were most frequently encountered in seven and ten year old dogs. Beta hemolytic enteric streptococci occurred most often in dogs of five and ten years. Although the streptococci seemed to be present in high incidence in the tenth year, this may well be due to the low numbers of samples in this age group. For this reason there seem to be no demonstrable trends evident. This is also true of the staphylococci. Staphylococcus albus was encountered more often in the five and nine year old dogs, while Staphylococcus epidermidis demonstrated little variation when compared with the ages of the dogs. E. coli occurred most commonly in two, three, and nine year old dogs, while Aerobacter species demonstrated little variation when compared with the ages of the dogs. Pseudomonas was constant in occurrence when compared with age. Proteus demonstrated a slight increase in incidence with increasing age (Figure 8).

The antibiotic sensitivity data are listed in Tables XXXI and XXXII, and summarized in Figure 7. Dihydrostreptomycin and chloromycetin appeared most effective in inhibiting the heterogeneous flora of the anal sacs and neomycin was almost equally effective. This

data compares favorably with that of Craige (1948, 1949) who reported that streptomycin when given orally was very effective against Proteus group organisms isolated from the intestinal tract of dogs. The results obtained from Schwenberg, Jacob and Rutenberg (1952) and Ferguson (1957) appear to agree with the results obtained with necrycin.

The flora of the anal sacs seems very similar to the flora of the lower intestinal tract of the dog. Schwenburg, Jacob and Rutenberg (1952) reported isolating E. coli, Aerobacter, Clostridium welchii, enterococci, Proteus vulgaris, Staphylococcus aureus hemolyticus, beta hemolytic streptococci, Pseudomonas, and yeasts from this area. It may well be true that in the uninfected anal sac, the flora is the same as that of the lower digestive tract. Whether this is true of the infected anal sac has yet to be determined. A comparison of the infected and non-infected anal sac might well disclose a causative microorganism. On the other hand, the flora of the two may be the same. If this is the case, a comparison of the percent concentration of the organisms within the two may demonstrate an anal sac pathogen.

Schirmer (1957) questions the ability of the clinician to accurately determine at all times whether the anal sac is definitely infected. He points out that the constant discharge from the sac makes this diagnosis extremely difficult. In general, a review of the literature indicates that the actual assurance that anal sac infection exists occurs only when certain conditions believed to be the result of the anal sac infection are improved by therapy.

Other possibilities to be included in considering that a microorganism pathogenic for the anal sacs is responsible for the disease would be the various serologic types of E. coli and Proteus. There may well be existing within these groups a condition similar to that in infant diarrhea which in some cases is believed to be caused by certain serologic types of E. coli (Ferguson, 1957). Craige (1948), Cherry, Lentz, and Barnes (1946), Cooper, Davis and Wiseman (1941), and Gorham (1949) entertain the possibility that members of the Proteus group may be the causative agents in certain intestinal disturbances in dogs. Craige (1949) lists Proteus as one of the microorganisms believed to be responsible for dysentery in dogs. Cooper, Davis and Wiseman (1941) and Cherry, Lentz and Barnes (1946) have indicated that strains of Proteus mirabilis were responsible for an outbreak of gastroenteritis.

Analysis of the data obtained from this study indicates that the incidence of Proteus is more frequent with increasing age, in the dark gray colored anal sac secretions, and in the males. This tends to indicate that Proteus may be responsible for the initial infection either before or after injury to the epithelium of the sac. The ability of members of the Proteus group to become enteric pathogens while residents of the intestinal tract of man or animals is open to question; such may occur under proper conditions, one must concede. E. coli occurred most frequently in females, in the gray colored secretions, and in two, three and nine year old dogs. These facts coupled with the generally high incidence of E. coli when compared with the other microorganisms may be interpreted

to indicate that an examination of the types of E. coli present in the secretion and the correlation of this data with infection of the sac may prove valuable.

Other factors of importance in considering anal sac disease include a thorough understanding of the physiology and biochemistry of the sac and its glands. It may well be true that knowledge of these factors could uncover the entity initially responsible for anal sac disease.

SUMMARY AND CONCLUSION

The bacterial flora of 125 canine anal sacs was determined accompanied with a procedure for the isolation of microorganisms from the sacs. The effect of 12 antibiotics on the heterogeneous flora of the sac secretions, and a review of anal sac anatomy, histology, pathology and physiology, was discussed.

The organisms isolated included E. coli, Streptococcus liquefaciens, Streptococcus zymogenes, Proteus morganii, Aerobacter species, Staphylococcus albus, Staphylococcus epidermidis, Pseudomonas aeruginosa, and some unidentified yeasts.

In an attempt to provide the clinician with an easier and more rapid means to analyze the data, the microorganisms isolated were grouped in the following manner:

1. Nonhemolytic enteric streptococci,
2. Alpha hemolytic enteric streptococci,
3. Beta hemolytic enteric streptococci,
4. Staphylococcus albus,
5. Staphylococcus epidermidis,
6. E. coli,
7. Aerobacter,
8. Proteus morganii,
9. Unidentified yeast,
10. Pseudomonas aeruginosa.

Using this grouping of microorganisms, their occurrence within the anal sac was analyzed with relation to the sex of the dog, the age

of the dog, the color of the anal sac secretion, and the classification of breeds as recommended by the American Kennel Club. The anal sacs of the males showed a higher incidence of Proteus, Aerobacter, and yeasts while those of the female indicated a higher incidence of E. coli and Staphylococcus albus. The breed classification as recommended by the American Kennel Club demonstrated no correlation with the flora present. The color of the secretion indicated the possibility that certain microorganisms might be present. In the green colored secretions the incidence of alpha hemolytic enteric streptococci and Pseudomonas aeruginosa were highest. Staphylococcus albus was highest in incidence in the brown colored secretions. E. coli and Proteus were highest in occurrence in the gray colored secretions.

In general, these trends need corroboration with many more samples before they could be considered in any way definite. In comparing the age of the dogs with each of the organism groupings, only Proteus demonstrated any definite trend. The incidence of Proteus increased with age.

The antibiotic inhibition of the anal sac flora of 21 samples was determined. Dihydrostreptomycin and chloromycetin demonstrated the most marked inhibition while neomycin appeared to be the third most effective.

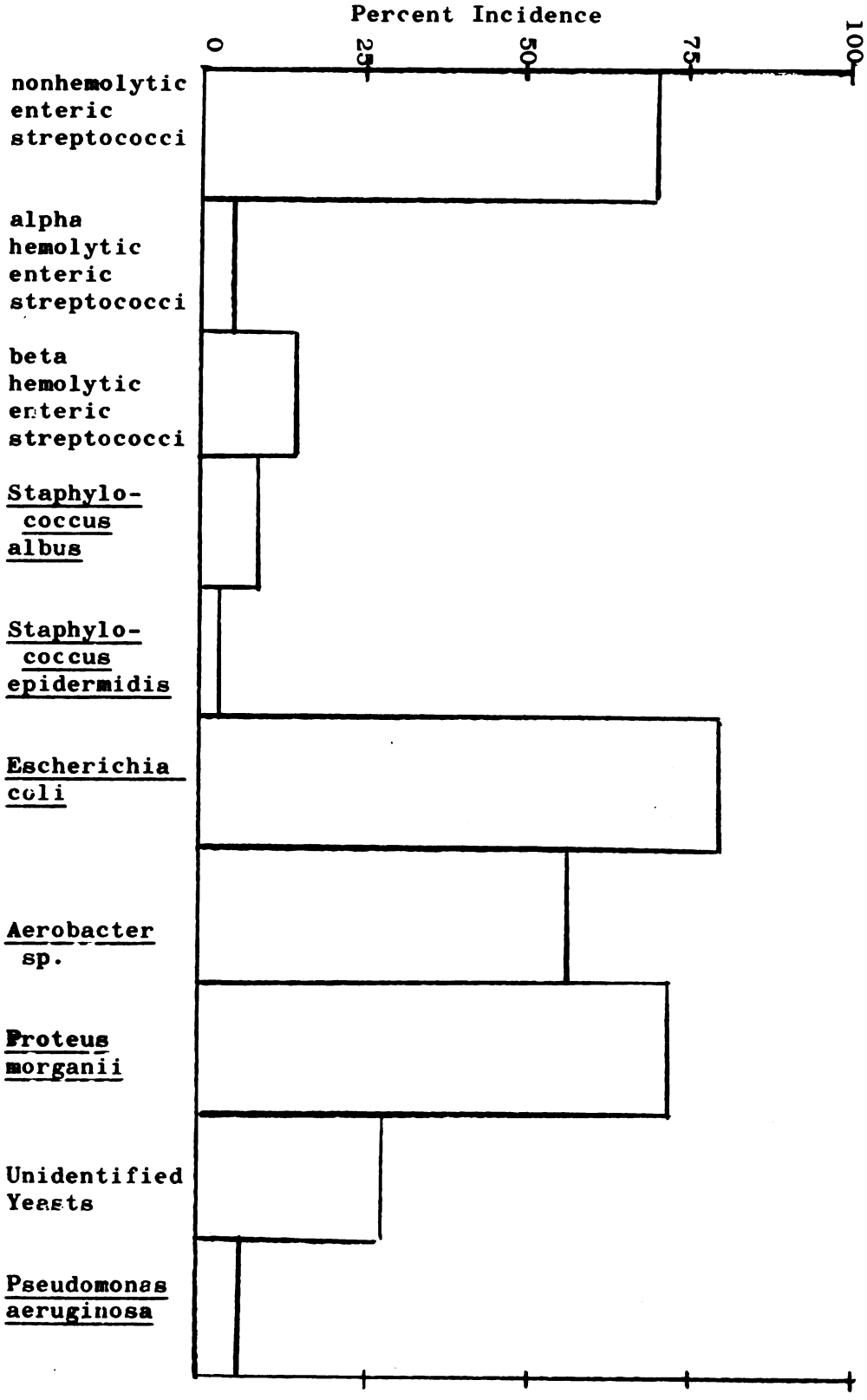


Fig. 1. The percentage incidence of the respective microorganisms isolated from 125 canine anal sacs.

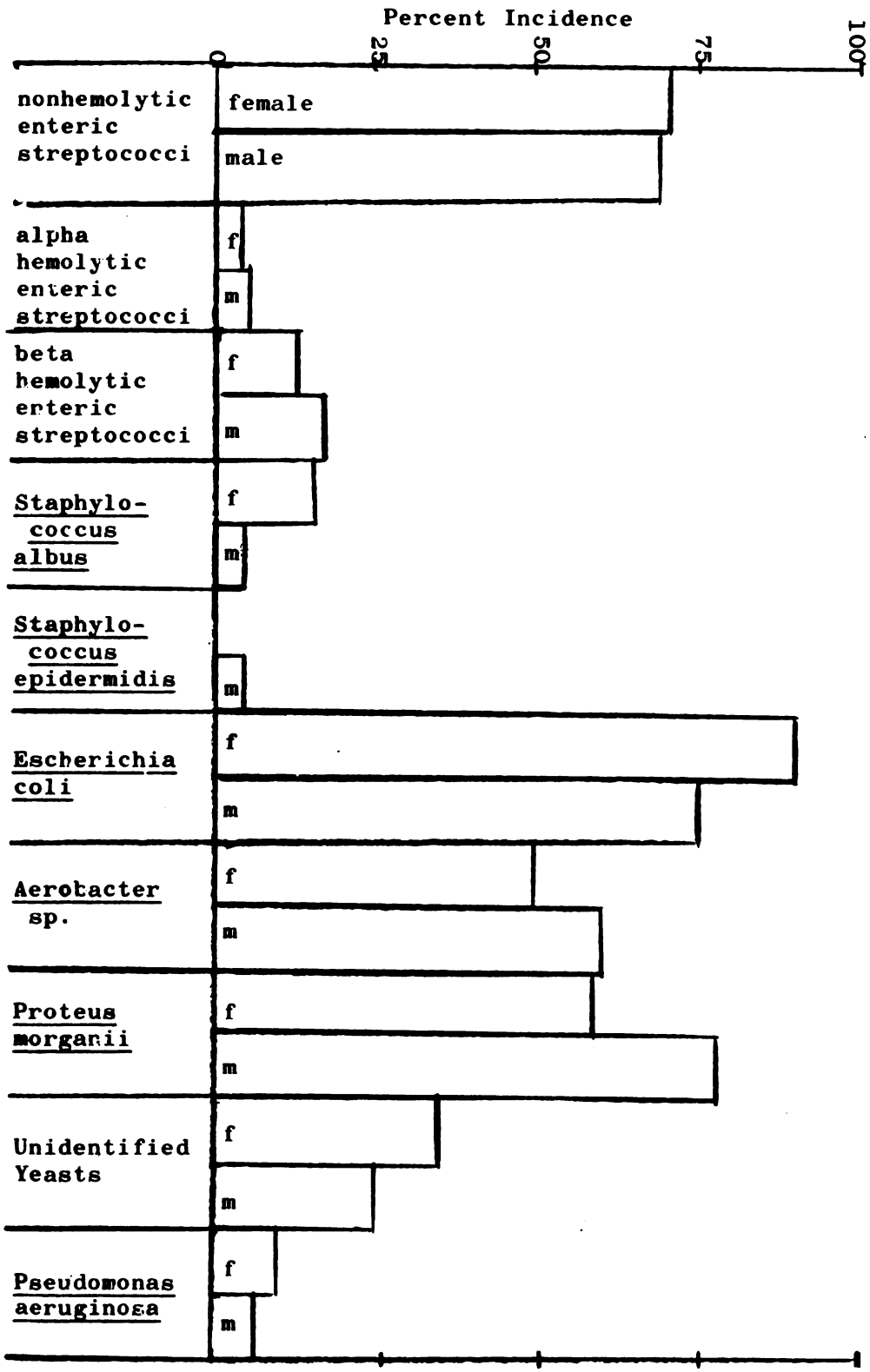


Fig. 2. A comparison of the percent incidence of the respective microorganisms isolated from 124 canine anal sacs with the sex of the animals.

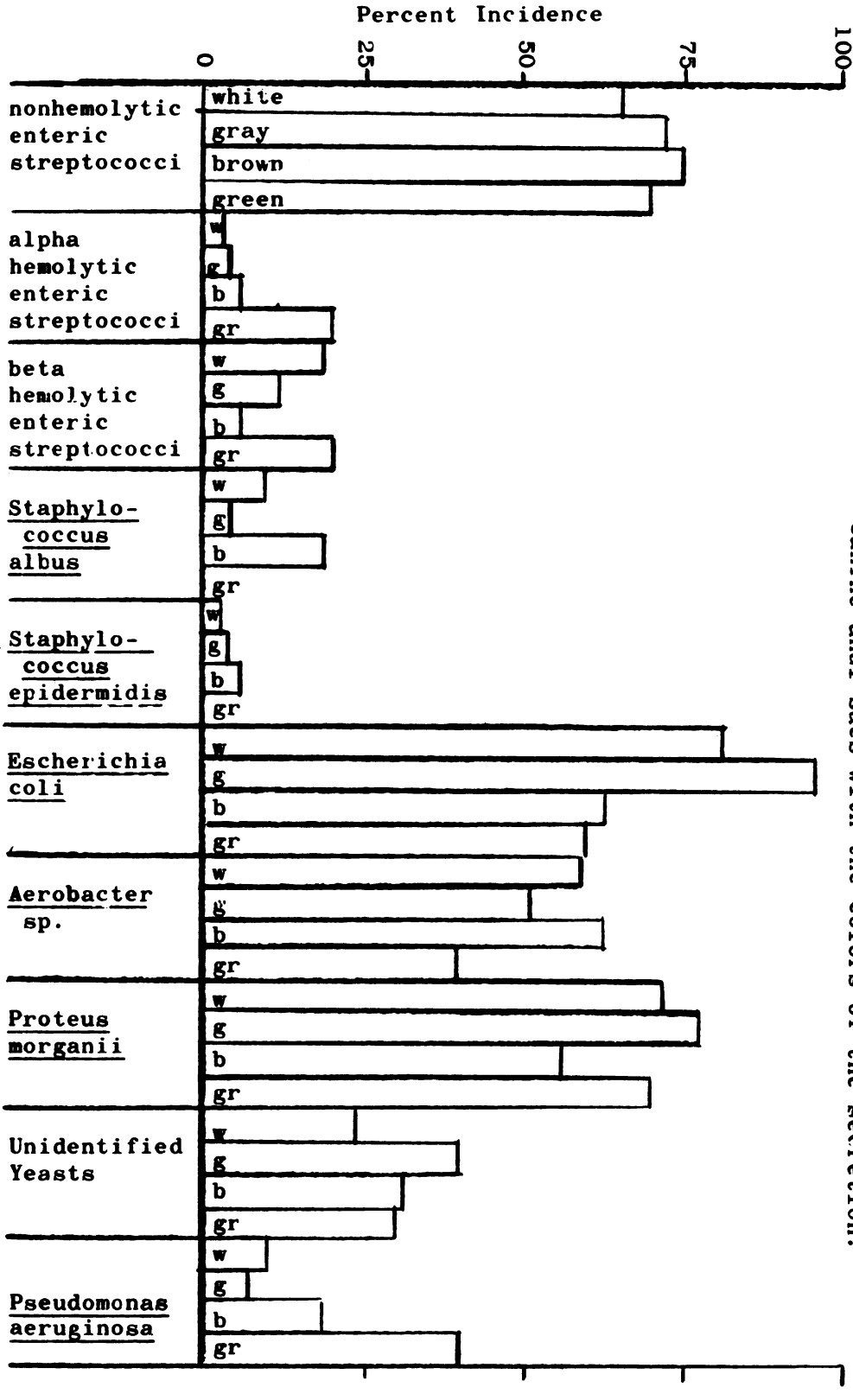
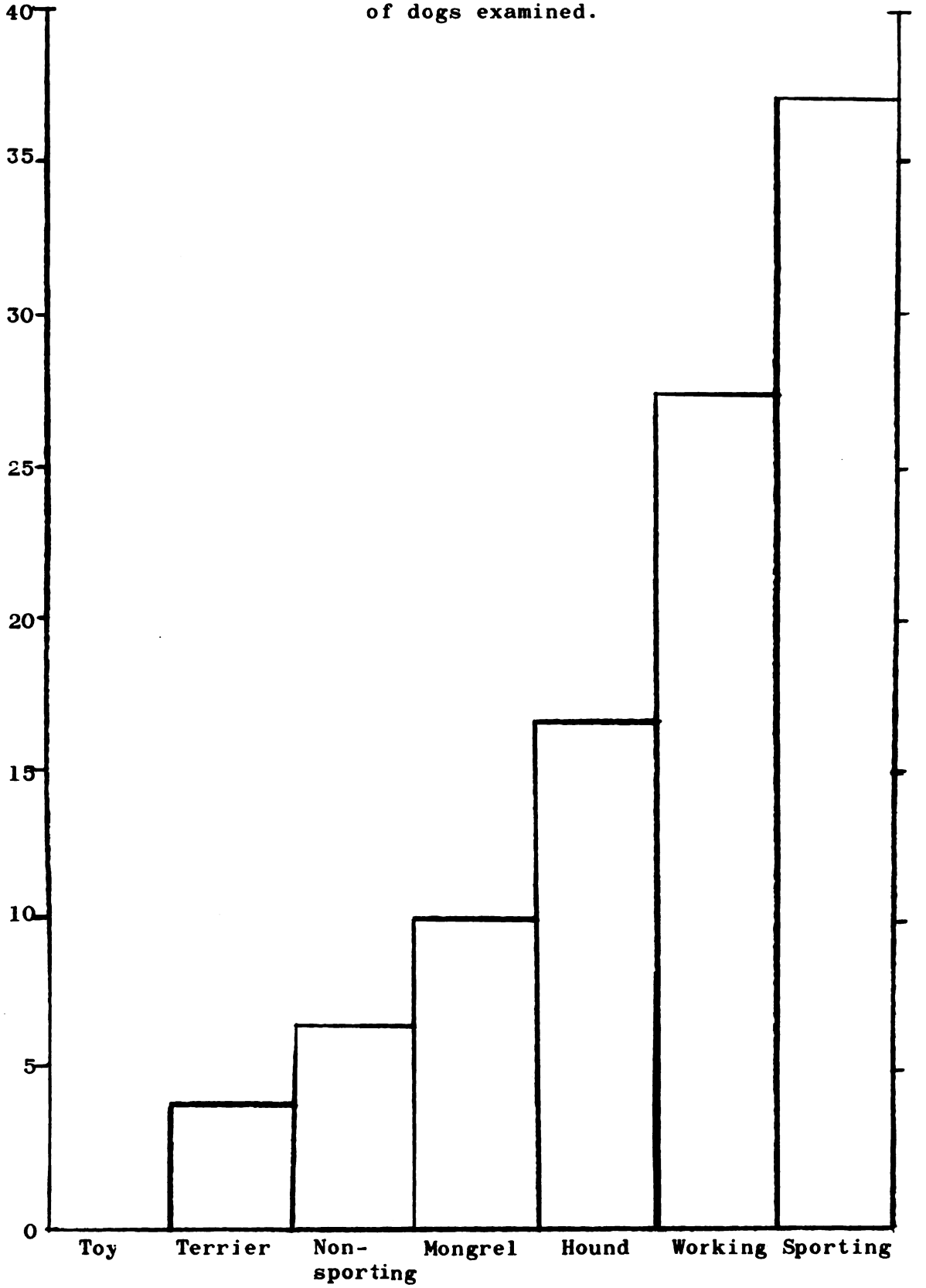


Fig. 3. A comparison of the percent incidence of the respective microorganisms isolated from 125 canine anal sacs with the colors of the secretion.

Fig. 4. A comparison of the percent occurrence of the different A.K.C. groupings of dogs examined.



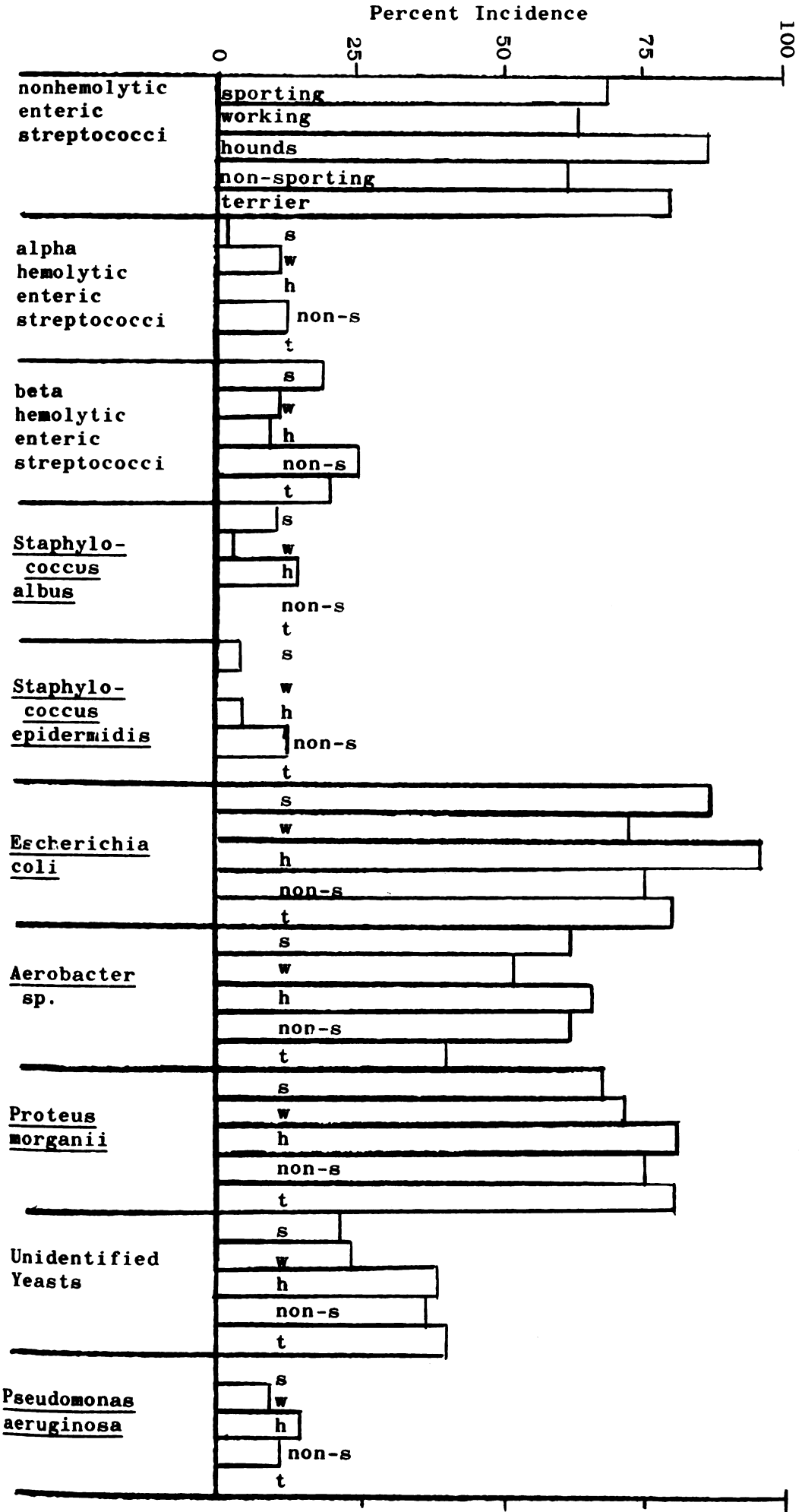


Fig. 5. A comparison of the percent incidence of the respective microorganisms isolated from the canine anal sacs with the A.K.C. groupings.

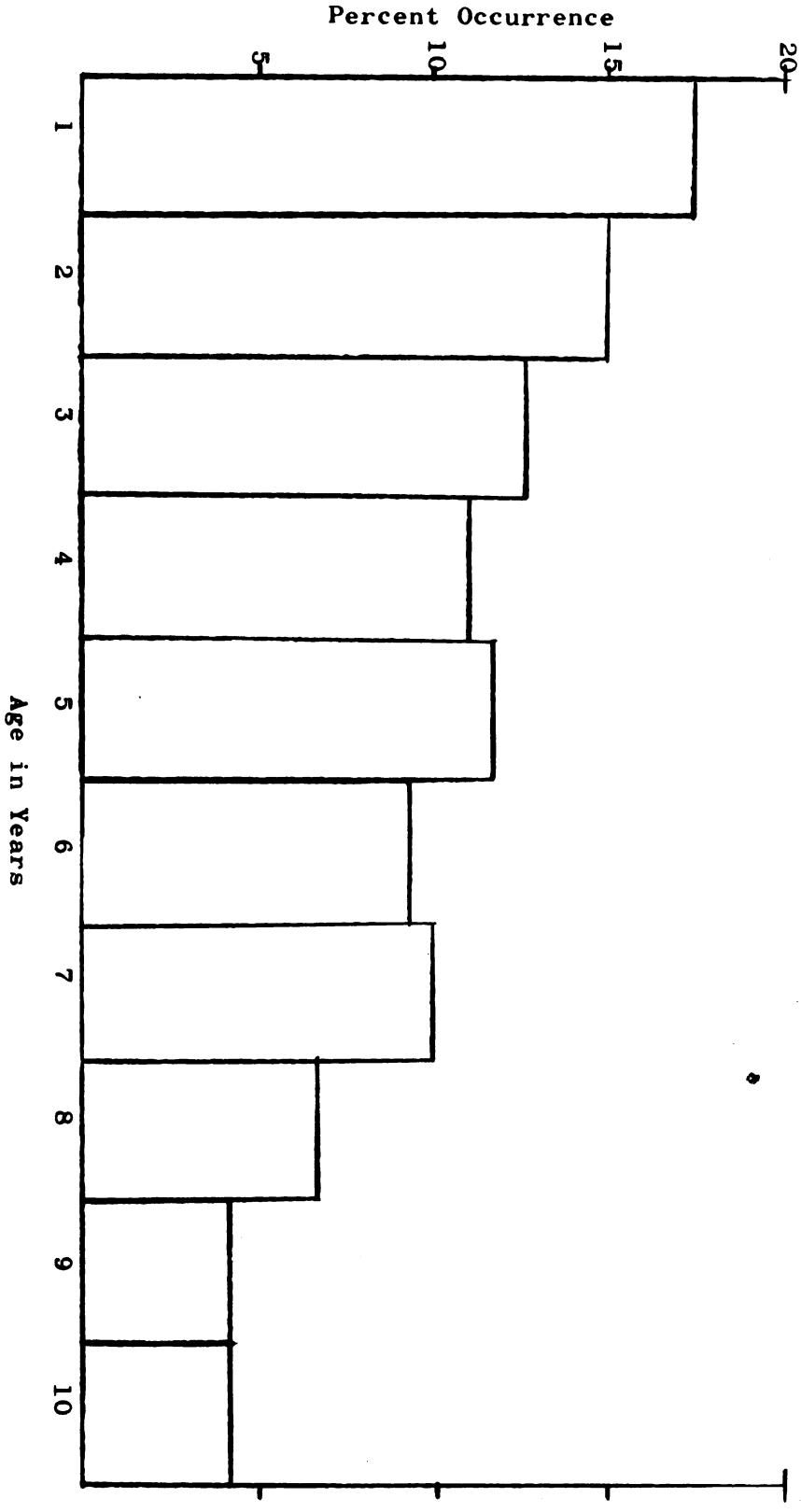


Fig. 6. A comparison of the percent occurrence of the ages of the dogs examined.

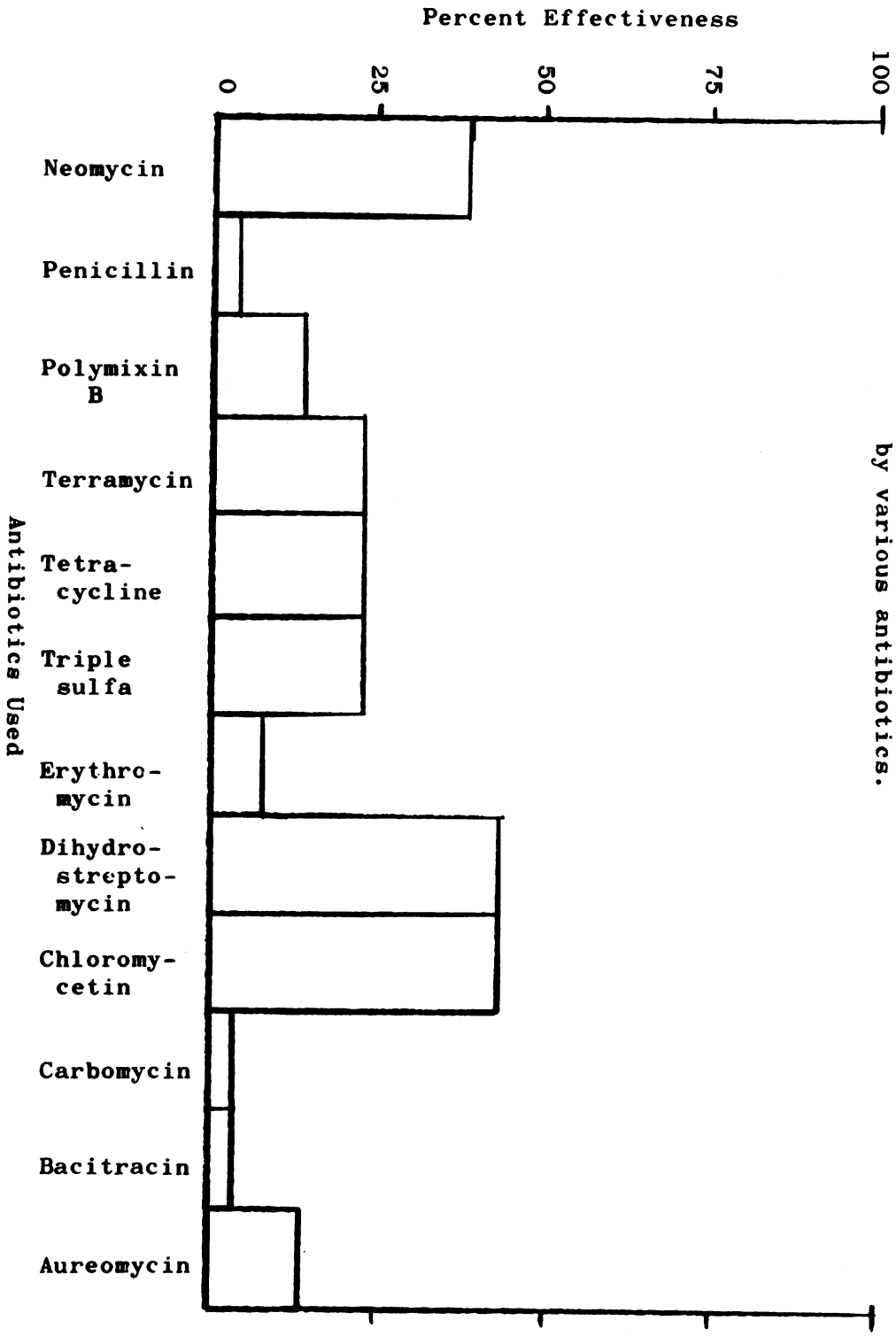


Fig. 7. Inhibition of total anal sac bacterial flora by various antibiotics.

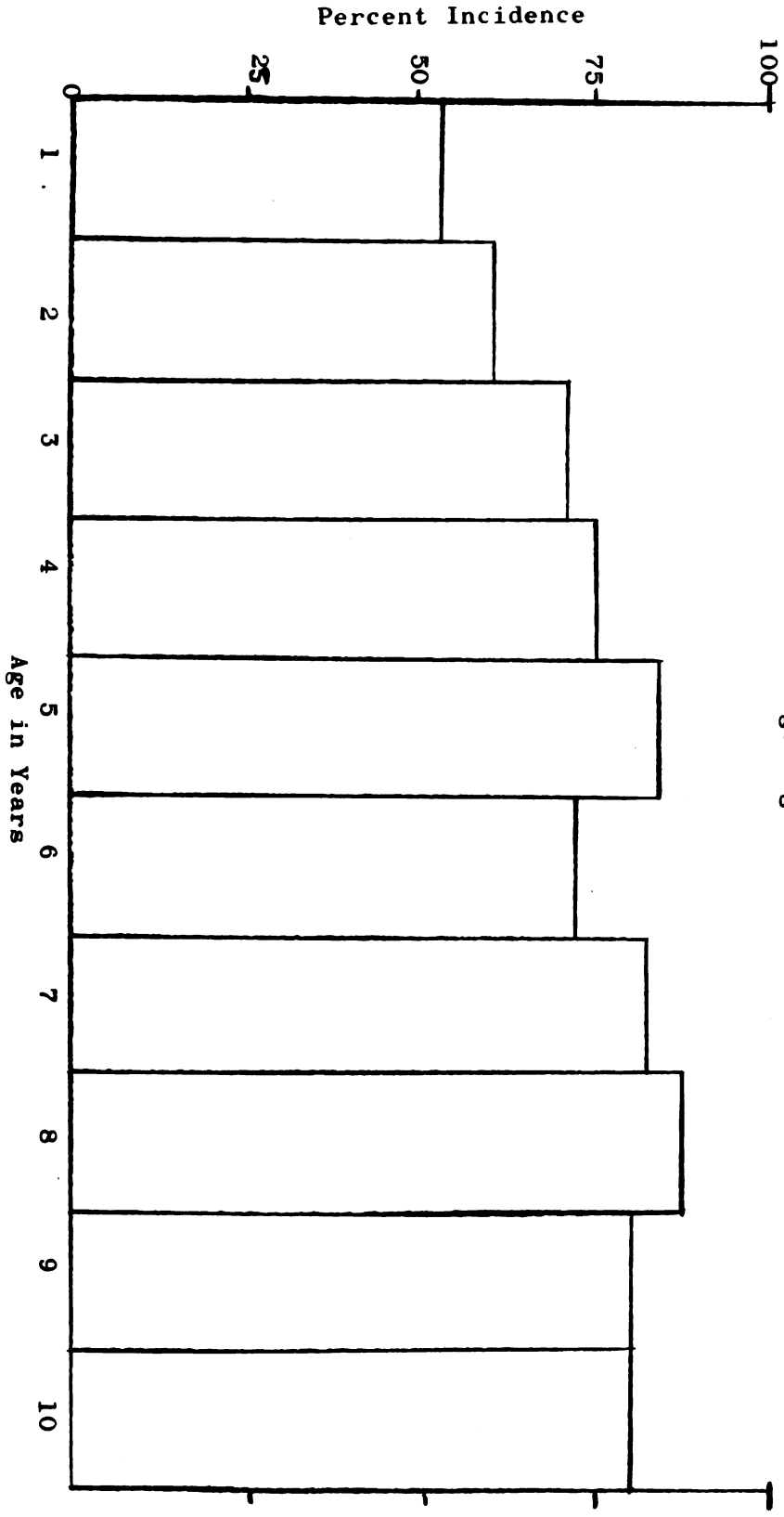


Fig. 8. A comparison of the incidence of Proteus morganii found in the anal sacs with the dogs' ages.

TABLE I

THE MICROORGANISMS ISOLATED FROM 125 CANINE ANAL SACS

Sample Number	nonhemolytic enteric streptococci	alpha hemolytic enteric streptococci	beta hemolytic enteric streptococci	Staphylococcus albus	Staphylococcus epidermidis	Escherichia coli	Aerobacter sp.	Proteus morganii	Unidentified Yeasts	Pseudomonas aeruginosa
1	+	-	-	+	-	+	-	+	-	-
2	+	-	-	+	-	+	-	+	-	-
3	+	-	-	-	-	+	-	+	-	+
4	+	-	-	-	-	+	-	+	-	-
5	+	-	-	+	-	+	-	+	-	+
6	+	-	-	-	-	+	-	+	-	-
7	+	-	-	-	-	+	-	+	-	-
8	+	-	-	-	-	-	+	+	-	-
9	+	-	-	-	-	-	+	+	-	-
10	+	-	-	-	-	+	+	-	-	-
11	+	-	-	-	-	+	+	+	-	-
12	+	-	-	-	-	+	-	-	+	-
13	+	-	-	-	-	-	-	+	+	-
14	+	-	-	-	-	+	-	+	-	+
15	+	-	-	-	-	+	+	+	-	-
16	+	-	-	-	-	-	+	+	-	-
17	+	-	-	-	+	+	-	+	-	-
18	+	-	-	-	-	+	-	-	+	-
19	+	-	-	+	-	+	-	+	-	-
20	+	-	-	-	-	+	+	-	-	-
21	+	-	-	-	-	-	+	+	-	-
22	+	-	-	-	-	-	+	+	-	-
23	+	-	-	-	-	+	+	+	-	-
24	+	-	-	-	-	+	+	+	-	-
25	+	-	-	-	-	-	+	-	+	-
26	+	-	-	-	-	+	-	-	+	-
27	+	-	-	-	-	+	+	+	-	-
28	+	-	-	-	-	-	+	+	-	-
29	+	-	-	-	+	+	+	+	-	-

TABLE I -- Continued

Sample Number	nonhemolytic enteric streptococci	alpha hemolytic enteric streptococci	beta hemolytic enteric streptococci	Staphylococcus albus	Staphylococcus epidermidis	Escherichia coli	Aerobacter sp.	Proteus morganii	Unidentified Yeasts	Pseudomonas aeruginosa
30	+	-	-	-	-	-	+	+	-	-
31	+	-	-	-	-	+	+	+	-	-
32	+	-	-	-	-	+	+	+	-	-
33	+	-	-	+	-	+	+	+	-	-
34	+	-	-	-	-	+	+	+	-	-
35	+	-	-	-	-	+	+	+	-	-
36	+	-	-	-	-	+	+	+	-	-
37	+	-	-	-	+	+	+	-	-	-
38	-	-	-	+	-	+	+	-	-	-
39	-	-	-	-	-	+	+	+	-	-
40	-	-	-	-	+	+	+	-	-	+
41	-	-	-	-	-	+	+	+	-	-
42	-	-	-	-	-	+	+	+	+	-
43	-	-	-	-	-	+	+	-	+	-
44	-	-	-	-	-	+	-	+	+	-
45	-	-	-	-	-	+	-	-	+	-
46	-	-	-	-	-	+	+	+	-	-
47	-	-	-	-	-	+	+	+	-	-
48	-	-	-	-	-	-	+	+	+	-
49	-	-	-	-	-	+	+	-	+	-
50	-	-	-	+	-	+	+	+	-	-
51	+	-	-	-	-	+	+	-	-	-
52	+	-	-	-	-	-	-	+	+	-
53	+	-	-	-	-	-	-	+	+	-
54	+	-	-	-	-	-	-	+	+	+
55	+	-	-	-	-	-	-	+	+	-
56	+	-	-	-	-	+	+	+	+	-
57	-	-	-	+	-	+	-	+	-	-
58	+	-	-	-	-	+	+	+	-	-
59	+	-	-	-	-	-	+	-	+	+
60	+	-	-	-	-	-	+	-	+	-
61	+	-	-	-	-	-	-	+	+	-

TABLE I -- Continued

Sample Number	nonhemolytic enteric streptococci	alpha hemolytic enteric streptococci	beta hemolytic enteric streptococci	Staphylococcus albus	Staphylococcus epidermidis	Escherichia coli	Aerobacter sp.	Proteus morganii	Unidentified Yeasts	Pseudomonas aeruginosa
62	+	-	-	-	-	+	-	-	+	+
63	+	-	-	-	-	-	-	+	+	-
64	+	-	-	-	-	+	+	-	-	-
65	+	-	-	-	-	+	-	+	-	-
66	+	-	-	-	-	+	+	+	+	-
67	+	-	-	-	-	+	-	+	-	-
68	+	-	-	-	-	+	+	+	+	-
69	-	-	+	-	-	+	-	+	-	-
70	-	+	+	-	-	+	+	+	+	-
71	-	-	+	-	-	+	-	+	-	-
72	+	+	-	-	-	+	+	-	-	-
73	-	-	-	-	-	+	+	+	-	-
74	+	-	-	-	-	+	+	+	+	-
75	+	-	-	-	-	+	+	+	+	-
76	+	-	-	-	-	+	+	+	+	-
78	-	-	-	-	-	+	-	+	-	-
79	-	-	-	-	-	+	-	-	-	-
80	+	-	-	-	-	+	+	+	-	-
81	-	-	-	-	-	-	+	+	-	-
82	-	-	-	-	-	+	-	+	-	-
83	-	-	-	-	-	-	+	+	-	-
84	-	-	-	-	-	-	+	+	-	-
85	+	-	-	-	-	+	+	+	-	-
86	+	-	-	+	-	+	+	-	+	-
87	+	-	-	-	-	+	-	+	-	-
88	-	-	-	-	-	+	-	+	+	-
89	+	-	-	-	-	+	+	+	-	-
90	+	-	-	-	-	+	-	+	+	-
91	+	-	-	-	-	+	+	-	-	-
92	+	-	-	-	-	+	+	+	-	-

TABLE I -- Continued

Sample Number	nonhemolytic enteric streptococci	alpha hemolytic enteric streptocccis	beta hemolytic enteric streptococci	Staphylococcus albus	Staphylococcus epidermidis	Escherichia coli	Aerobacter sp.	Proteus morganii	Unidentified Yeasts	Pseudomonas aeruginosa
93	+	-	-	-	-	+	+	+	-	-
94	-	-	-	-	-	+	+	+	-	-
95	+	-	-	+	-	+	-	-	+	-
96	+	-	-	-	-	+	+	+	-	-
97	+	-	-	-	-	+	+	+	-	-
98	+	-	-	-	-	+	+	+	-	-
99	+	-	-	-	-	+	+	+	+	-
100	+	-	-	+	-	+	-	-	+	-
101	+	-	+	-	-	+	-	-	-	-
102	+	-	-	-	-	+	-	-	+	-
103	+	+	-	-	-	+	-	-	+	+
104	-	+	-	-	-	+	-	-	-	-
105	+	-	-	-	-	+	-	-	+	-
106	-	-	+	-	-	+	+	-	-	-
107	-	-	+	-	-	-	+	+	-	-
108	-	+	+	-	-	-	-	+	-	-
109	+	-	+	-	-	+	-	-	-	-
110	+	-	+	-	-	+	+	-	-	-
111	-	-	+	-	-	+	+	+	-	-
112	+	-	+	-	-	-	-	+	-	-
113	+	-	+	-	-	+	-	-	-	-
114	+	+	+	-	-	+	-	-	-	+
115	+	-	-	-	-	+	-	+	-	-
116	+	-	-	-	-	+	+	+	-	-
117	+	-	-	-	-	+	-	+	-	-
118	+	+	+	-	-	+	+	-	-	-
119	-	+	+	-	-	+	-	-	+	+
120	+	-	-	-	-	+	-	-	-	-
121	+	-	-	-	-	+	+	+	-	-
122	+	-	-	-	-	+	+	+	-	-
123	-	-	-	-	-	+	-	+	-	-
124	-	-	-	-	-	+	+	+	-	-
125	-	-	-	-	-	+	-	+	-	-

TABLE II

A SUMMARY OF THE CLASSIFICATION DATA ON THE 125 DOGS WHOSE ANAL SACS WERE EXAMINED FOR THEIR BACTERIAL FLORA

Sample Number	Age	Sex	Breed	Color of Secretion	Presumptive Diagnosis
1	3 yrs	Female	Beagle	cloudy white	normal
2	4 yrs	Female	English Setter	cloudy white	pustular dermatitis
3	2½ yrs	Male	Boxer	dark green	sprain, left foreleg
4	8 yrs	Male	German short hair Pointer	cloudy gray white	dermatitis and possible anal sac infection
5	___	Male	Beagle	dark brown	conjunctivitis
6	2½ yrs	Male	Beagle	cloudy gray white	parasitism
7	8 yrs	Male	Irish Terrier	gray white	dermatitis
8	5 yrs	Male	Boxer	gray white	nephritis
9	7 yrs	Male	Boxer	gray white	arthritis
10	9 yrs	Male	Pointer	gray white	anal sac abscess
11	1½ yrs	Female	Great Dane	gray white	chronic enterocolitis
12	2½ yrs	Female	Great Dane	light brown	enterocolitis
13	2 yrs	Male	Springer Spaniel	gray white	ulcerative otitis
14	3 yrs	Female	Cocker Spaniel	dark brown	gastroenteritis
15	1 yr	Male	Cocker Spaniel	white, cloudy packed	hemorrhagic colitis
16	5 yrs	Male	Boxer	light brown	undiagnosed
17	8 yrs	Male	Dalmation	white, cloudy	gout
18	____	Female	Boston Terrier	cream, cloudy	distemper

TABLE II -- Continued

Sample Number	Age	Sex	Breed	Color of Secretion	Presumptive Diagnosis
19	3 yrs	Female	Mongrel	white, cloudy	infectious dermatitis
20	5 yrs	Female	German short hair Pointer	light brown	urocystitis
21	4 yrs	Male	Fox Terrier	dark brown	gastritis
22	7 yrs	Male	English Setter	gray white	contusion
23	3 yrs	Male	Collie	gray white	urocystitis
24	7 yrs	Male	Beagle	cloudy white	encephalitis
25	2 yrs	Male	Labrador	cloudy white	keratoconjunctivitis
26	1 yrs	Female	Labrador	gray white	undiagnosed
27	2 yrs	Male	Weimaraner	cloudy white	enterocolitis
28	____	____	English Setter	cloudy white	_____
29	7 yrs	Male	English Setter	cloudy white	prostatitis
30	1 yr	Male	Hound	dark green	bladder neoplasm
31	6 yrs	Male	Beagle	dark green	arthritis
32	10 yrs	Female	Bulldog	cloudy white	abdominal neoplasm
33	9 yrs	Female	Springer Spaniel	cloudy white	urocystitis, chronic
34	8 yrs	Female	Cocker Spaniel	cloudy white	infectious kerato-conjunctivitis
35	5 yrs	Female	Cocker Spaniel	cloudy white	dermatitis
36	1 yr	Male	Cocker Spaniel	cloudy white	gastroenteritis
37	3 yrs	Male	Brittany Spaniel	brown	tonsilitis
38	4 yrs	Female	Boxer	brown	ancylostomiasis
39	1 yr	Male	Doberman	cloudy white	contusion
40	2½ yrs	Male	Beagle	gray, cloudy	enterocolitis
41	3½ yrs	Male	German Shepherd	dark green	Pannus
42	1½ yrs	Female	Beagle	dark gray	gastritis
43	½ yr	Male	Collie	cloudy white	dermatitis
44	9 yrs	Female	Gordon Setter	dark grey	arthritis

TABLE II -- Continued

Sample Number	Age	Sex	Breed	Color of Secretion	Presumptive Diagnosis
45	1 yr	Female	Mongrel	white	contusion
46	1½ yrs	Male	blue tick hound	white	neoplasm, skin
47	1 yr	Female	Mongrel	gray	dermatitis
48	8 yrs	Male	Beagle	thick brown	hypothyroidism
49	6 yrs	Female	Pointer	cloudy white	bacteremia
50	3 yrs	Male	English Pointer	cloudy white	dermatitis
51	2½ yrs	Male	Boxer	cloudy white	abscess
52	5 yrs	Male	Hound	brown	ligament rupture
53	½ yr	Female	Poodle	cloudy white	coccidiosis
54	½ yr	Female	Mongrel	thick green	mange, demodectic
55	4 yrs	Male	Boxer	cloudy gray	keratoconjunctivitis
56	3 yrs	Male	Coonhound	cloudy gray	sinusitis
57	9 yrs	Male	English Setter	cloudy white	dermatitis
58	2 yrs	Male	blue tick hound	cloudy white	neoplasms
59		Male	Dalmation	dark brown	luxation, intervertebral disc
60	5½ yrs	Female	Dachshund	cloudy white	urinary caliculi
61	7½ yrs	Male	Great Dane	cloudy gray	encephalitis
62	8 yrs	Female	Beagle	green	intestinal parasitism and fleas
63	____	Male	Mongrel	cloudy white	osteomyelitis
64	2 yrs	Male	German short hair Pointer	cloudy white	intestinal parasitism
65	1 yr	Male	Labrador	cloudy white	mange, demodectic
66	8 yrs	Male	Cocker Spaniel	cloudy white	dental tartar
67	4 yrs	Male	Springer Spaniel	cloudy white	dermatitis
68	2½ yrs	Male	Beagle	cloudy white	intestinal parasitism
69	5 yrs	Female	Boxer	clear white	tracheitis
70	4 yrs	Male	Poodle	clear white	dermatitis
71	5½ yrs	Female	Terrier	clear white	luxation, intervertebral disc

TABLE II -- Continued

Sample Number	Age	Sex	Breed	Color of Secretion	Presumptive Diagnosis
72	1 yr	Female	Brittany Spaniel	cloudy white	wounds, lacerated
73	6 yrs	Male	Poodle	cloudy white	lymphosarcoma
74	2½ yrs	Female	Weimaraner	cloudy white	fracture, left femur
75	9 yrs	Male	Cocker Spaniel	cloudy gray	undiagnosed
76	7½ yrs	Male	Terrier	cloudy white	conjunctivitis, chronic
77	2½ yrs	Female	Labrador	cloudy white	dermatitis
78	1 yr	Female	Beagle	cloudy white	keratitis, ulcerative
79	10 yrs	Male	Labrador	cloudy gray	dermatitis, infectious
80	1 yr	Male	Boxer	gray white	neoplasm, skin
81	7 yr	Male	Boxer	gray white	neoplasm, skin
82	5 yrs	Male	Boxer	gray white	abscess
83	6 yrs	Male	English Setter	gray white	muscle rupture
84	6 yrs	Male	German Shepherd	gray white	bacterial pericarditis
85	4 yrs	Female	Cocker Spaniel	whitish gray	conjunctivitis, acute
86	1 yrs	Female	Mongrel	gray white	dermatitis, allergic
87	5 yrs	Male	Boxer	gray white	keratitis, ulcerative
88		Male	Red Bone	gray	perianal fistula
89	3 yrs	Male	German Shepherd	grayish brown	dermatitis
90	7½ yrs	Male	Boxer	gray	keratitis, ulcerative
91	2½ yrs	Male	Weimaraner	gray	ancylostomiasis and coccidiosis
92	5 yrs	Male	English Pointer	gray	gastritis, chronic
93	3 yrs	Female	Beagle	gray white	contusion
94	3 yrs	Male	Irish Setter	gray yellow	encephalitis
95	4 yrs	Male	Spitz	gray brown	dermatitis, photo-sensitive
96	4 yrs	Male	Mongrel	gray	dermatitis
97	7½ yrs	Male	blue tick hound	gray	abscess, postorbital

TABLE II -- Continued

Sample Number	Age	Sex	Breed	Color of Secretion	Presumptive Diagnosis
98	2½ yrs	Female	Brittany Spaniel	gray brown	undiagnosed
99	6 yrs	Female	Doberman	gray green	chorea
100	6 yrs	Female	Irish Setter	gray	otitis
101	5 mo	Male	Dachshund	clear white	mange, demodectic
102	3½ yrs	Male	Beagle	gray	luxation, interverte-bral disc
103	10 yrs	Male	Boxer	dark gray	neoplasm, frontal sinus
104	7 yrs	Male	Boxer	gray brown	keratitis, ulcerative
105	1½ yrs	Female	Boxer	clear white	dermatitis
106	2 yrs	Female	Cocker Spaniel	clear white	urticaria
107	6 yrs	Male	Mongrel	clear white	filariasis
108	7 yrs	Male	Boxer	dark green	keratitis, ulcerative
109	2 yrs	Male	English Setter	cloudy white	intestinal parasitism
110	4 yrs	Male	Poodle	cloudy white	stomatitis, ulcerative
111	2½ yrs	Male	Springer Spaniel	clear white	dermatitis
112	10 yrs	Male	Boxer	clear white	neoplasm, frontal sinus
113	3½ yrs	Male	Beagle	cloudy white	luxation, interverte-bral disc
114	7 yrs	Female	German Shepherd	dark green	histoplasmosis
115	7 yrs	Male	Collie	clear white	congenital dysplasia
116	6 yrs	Male	English Setter	gray	keratitis, ulcerative
117	10 yrs	Male	Boxer	gray	neoplasm, brain
118	5 yrs	Female	Cocker Spaniel	gray	pseudopregnancy
119	6½ yrs	Female	English Setter	gray	neoplasm, skin
120	7½ yrs	Male	Cocker Spaniel	gray	castration

TABLE II -- Continued

Sample Number	Age	Sex	Breed	Color of Secretion	Presumptive Diagnosis
121	4 yrs	Male	Collie	gray	undiagnosed
122	3 yrs	Female	Collie	gray	fore leg paralysis
123	4 yrs	Female	Irish Setter	gray	foreign body, nose
124	5 yrs	Female	Collie	cloudy white	gastritis
125	8 yrs	Male	French poodle	cloudy white	otitis

TABLE III

SUMMARY OF IDENTIFICATION REACTIONS FOR STREPTOCOCCI ISOLATED FROM 110 CANINE ANAL SAC SAMPLES

Sample Number	Gram Stain	Hemolysis	Growth in Nutrient Broth with 6.5% NaCl	Growth in E.V.A. Broth	Gelatin Liquefaction	Mannitol Fermentation
1	Positive cocci	gamma	+	+	+	+
2	Positive cocci	gamma	+	+	+	+
3	Positive cocci	gamma	+	+	+	+
4	Positive cocci	gamma	+	+	+	+
5	Positive cocci	gamma	+	+	+	+
6	Positive cocci	gamma	+	+	+	+
7	Positive cocci	gamma	+	+	-	+
8	Positive cocci	gamma	+	+	+	+
9	Positive cocci	gamma	+	+	+	+
10	Positive cocci	gamma	+	+	+	+
11	Positive cocci	gamma	+	+	+	+
12	Positive cocci	gamma	+	+	+	+
13	Positive cocci	gamma	+	+	+	+
14	Positive cocci	gamma	+	+	+	+
15	Positive cocci	beta	+	+	+	+
16	Positive cocci	gamma	+	+	+	+
17	Positive cocci	gamma	+	+	+	+
18	Positive cocci	gamma	+	+	+	+

TABLE III -- Continued

Sample Number	Gram Stain	Hemolysis	Growth in Nutrient Broth with 6.5% NaCl	Growth in E.V.A. Broth	Gelatin Liquefaction	Mannitol Fermentation
19	Positive cocci	gamma	+	+	+	+
20	Positive cocci	gamma	+	+	+	+
21	Positive cocci	gamma	+	+	+	+
22	Positive cocci	gamma	+	+	+	+
23	Positive cocci	gamma	+	+	+	+
24	Positive cocci	gamma	+	+	+	+
25	Positive cocci	gamma	+	+	+	+
26	Positive cocci	gamma	+	+	+	+
27	Positive cocci	gamma	+	+	+	+
28	Positive cocci	gamma	+	+	+	+
29	Positive cocci	gamma	+	+	+	+
30	Positive cocci	gamma	+	+	+	+
31	Positive cocci	gamma	+	+	+	+
32	Positive cocci	gamma	+	+	+	+
33	Positive cocci	gamma	+	+	+	+
34	Positive cocci	gamma	+	+	±	+
35	Positive cocci	gamma	+	+	+	+
36	Positive cocci	gamma	+	+	+	+
37	Positive cocci	beta	+	+	+	+

TABLE III -- Continued

Sample Number	Gram Stain	Hemolysis	Growth in Nutrient Broth with 6.5% NaCl	Growth in E.V.A. Broth	Gelatin Liquefaction	Mannitol Fermentation
51	Positive cocci	gamma	+	+	+	+
52	Positive cocci	gamma	+	+	+	+
53	Positive cocci	gamma	+	+	+	+
54	Positive cocci	gamma	+	+	+	+
55	Positive cocci	gamma	+	+	+	+
56	Positive cocci	gamma	+	+	+	+
58	Positive cocci	gamma	+	+	+	+
59	Positive cocci	gamma	+	+	+	+
60	Positive cocci	gamma	+	+	+	+
61	Positive cocci	gamma	+	+	+	+
62	Positive cocci	gamma	+	+	+	+
63	Positive cocci	gamma	+	+	+	+
64	Positive cocci	gamma	+	+	+	+
65	Positive cocci	gamma	+	+	+	+
66	Positive cocci	beta	+	+	±	+
67	Positive cocci	gamma	+	+	+	+
68	Positive cocci	gamma	+	+	+	+
69	Positive cocci	beta	+	+	±	+
70	Positive cocci	beta	+	+	±	+

TABLE III -- Continued

Sample Number	Gram Stain	Hemolysis	Growth in Nutrient Broth with 6.5% NaCl	Growth in E.V.A. Broth	Gelatin Liquefaction	Mannitol Fermentation
70	Positive cocci	alpha	+	+	+	+
71	Positive cocci	beta	+	+	±	+
72	Positive cocci	gamma	+	+	+	+
72	Positive cocci	alpha	+	+	+	+
74	Positive cocci	gamma	+	+	+	+
75	Positive cocci	gamma	+	+	+	+
76	Positive cocci	gamma	+	+	+	+
77	Positive cocci	gamma	+	+	+	+
79	Positive cocci	gamma	+	+	+	+
85	Positive cocci	gamma	+	+	+	+
86	Positive cocci	gamma	+	+	+	+
87	Positive cocci	gamma	+	+	+	+
89	Positive cocci	gamma	+	+	+	+
90	Positive cocci	gamma	+	+	+	+
91	Positive cocci	gamma	+	+	+	+
92	Positive cocci	gamma	+	+	+	+
93	Positive cocci	gamma	+	+	+	+
95	Positive cocci	gamma	+	+	+	+
96	Positive cocci	gamma	+	+	+	+

TABLE III -- Continued

Sample Number	Gram Stain	Hemolysis	Growth in Nutrient Broth with 6.5% NaCl	Growth in E.V.A. Broth	Gelatin Liquefaction	Mannitol Fermentation
97	Positive cocci	gamma	+	+	+	+
98	Positive cocci	gamma	+	+	+	+
99	Positive cocci	gamma	+	+	+	+
100	Positive cocci	gamma	+	+	+	+
101	Positive cocci	gamma	+	+	+	+
102	Positive cocci	gamma	+	+	+	+
103	Positive cocci	gamma	+	+	+	+
103	Positive cocci	alpha	+	+	+	+
104	Positive cocci	alpha	+	+	+	+
105	Positive cocci	gamma	+	+	+	+
106	Positive cocci	beta	+	+	±	+
107	Positive cocci	beta	+	+	±	+
108	Positive cocci	alpha	+	+	+	+
108	Positive cocci	beta	+	+	±	+
109	Positive cocci	gamma	+	+	+	+
109	Positive cocci	beta	+	+	±	+
110	Positive cocci	beta	+	+	±	+
110	Positive cocci	gamma	+	+	+	+
111	Positive cocci	beta	+	+	±	+

TABLE III -- Continued

Sample Number	Gram Stain	Hemolysis	Growth in Nutrient Broth with 6.5% NaCl	Growth in E.V.A. Broth	Gelatin Liquefaction	Mannitol Fermentation
112	Positive cocci	gamma	+	+	+	+
112	Positive cocci	beta	+	+	±	+
113	Positive cocci	gamma	+	+	+	+
113	Positive cocci	beta	+	+	±	+
114	Positive cocci	beta	+	+	±	+
114	Positive cocci	gamma	+	+	+	+
114	Positive cocci	alpha	+	+	+	+
115	Positive cocci	gamma	+	+	+	+
116	Positive cocci	gamma	+	+	+	+
117	Positive cocci	gamma	+	+	+	+
118	Positive cocci	gamma	+	+	+	+
118	Positive cocci	beta	+	+	±	+
119	Positive cocci	beta	+	+	±	+
120	Positive cocci	beta	+	+	±	+
120	Positive cocci	gamma	+	+	+	+
121	Positive cocci	gamma	+	+	+	+
122	Positive cocci	gamma	+	+	+	+

TABLE IV

SUMMARY OF THE IDENTIFICATION REACTIONS USED FOR *E. COLI* ISOLATED FROM 101 CANINE ANAL SACS

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V.P. Reaction	Citrate Utilization
1	Negative rods	Typical *E. coli* type	+	+	-	-
2	Negative rods	Typical *E. coli* type	+	+	-	-
3	Negative rods	Typical *E. coli* type	+	+	-	-
4	Negative rods	Typical *E. coli* type	+	+	-	-
5	Negative rods	Typical *E. coli* type	+	+	-	-
6	Negative rods	Typical *E. coli* type	+	+	-	-
7	Negative rods	Typical *E. coli* type	+	+	-	-
10	Negative rods	Typical *E. coli* type	+	+	-	-
11	Negative rods	Typical *E. coli* type	+	+	-	-
12	Negative rods	Typical *E. coli* type	+	+	-	-
14	Negative rods	Typical *E. coli* type	+	+	-	-
15	Negative rods	Typical *E. coli* type	+	+	-	-
17	Negative rods	Typical *E. coli* type	+	+	-	-
18	Negative rods	Typical *E. coli* type	+	+	-	-
19	Negative rods	Typical *E. coli* type	+	+	-	-
20	Negative rods	Typical *E. coli* type	+	+	-	-
23	Negative rods	Typical *E. coli* type	+	+	-	-
24	Negative rods	Typical *E. coli* type	+	+	-	-

TABLE IV -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V.P. Reaction	Citrate Utilization
26	Negative rods	Typical *E. coli* type	+	+	-	-
27	Negative rods	Typical *E. coli* type	+	+	-	-
29	Negative rods	Typical *E. coli* type	+	+	-	-
31	Negative rods	Typical *E. coli* type	+	+	-	-
32	Negative rods	Typical *E. coli* type	+	+	-	-
33	Negative rods	Typical *E. coli* type	+	+	-	-
34	Negative rods	Typical *E. coli* type	+	+	-	-
35	Negative rods	Typical *E. coli* type	+	+	-	-
36	Negative rods	Typical *E. coli* type	+	+	-	-
37	Negative rods	Typical *E. coli* type	+	+	-	-
38	Negative rods	Typical *E. coli* type	+	+	-	-
39	Negative rods	Typical *E. coli* type	+	+	-	-
40	Negative rods	Typical *E. coli* type	+	+	-	-
41	Negative rods	Typical *E. coli* type	+	+	-	-
42	Negative rods	Typical *E. coli* type	+	+	-	-
43	Negative rods	Typical *E. coli* type	+	+	-	-
44	Negative rods	Typical *E. coli* type	+	+	-	-
45	Negative rods	Typical *E. coli* type	+	+	-	-
46	Negative rods	Typical *E. coli* type	+	+	-	-

TABLE IV -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utilization
47	Negative rods	Typical *E. coli* type	+	+	-	-
49	Negative rods	Typical *E. coli* type	+	+	-	-
50	Negative rods	Typical *E. coli* type	+	+	-	-
51	Negative rods	Typical *E. coli* type	+	+	-	-
56	Negative rods	Typical *E. coli* type	+	+	-	-
57	Negative rods	Typical *E. coli* type	+	+	-	-
58	Negative rods	Typical *E. coli* type	+	+	-	-
62	Negative rods	Typical *E. coli* type	+	+	-	-
63	Negative rods	Typical *E. coli* type	+	+	-	-
64	Negative rods	Typical *E. coli* type	+	+	-	-
65	Negative rods	Typical *E. coli* type	+	+	-	-
66	Negative rods	Typical *E. coli* type	+	+	-	-
67	Negative rods	Typical *E. coli* type	+	+	-	-
68	Negative rods	Typical *E. coli* type	+	+	-	-
69	Negative rods	Typical *E. coli* type	+	+	-	-
70	Negative rods	Typical *E. coli* type	+	+	-	-
71	Negative rods	Typical *E. coli* type	+	+	-	-
72	Negative rods	Typical *E. coli* type	+	+	-	-
73	Negative rods	Typical *E. coli* type	+	+	-	-

TABLE IV -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V.P. Reaction	Citrate Utilization
74	Negative rods	Typical *E. coli* type	+	+	-	-
75	Negative rods	Typical *E. coli* type	+	+	-	-
76	Negative rods	Typical *E. coli* type	+	+	-	-
77	Negative rods	Typical *E. coli* type	+	+	-	-
78	Negative rods	Typical *E. coli* type	+	+	-	-
79	Negative rods	Typical *E. coli* type	+	+	-	-
81	Negative rods	Typical *E. coli* type	+	+	-	-
82	Negative rods	Typical *E. coli* type	+	+	-	-
84	Negative rods	Typical *E. coli* type	+	+	-	-
85	Negative rods	Typical *E. coli* type	+	+	-	-
86	Negative rods	Typical *E. coli* type	+	+	-	-
87	Negative rods	Typical *E. coli* type	+	+	-	-
88	Negative rods	Typical *E. coli* type	+	+	-	-
89	Negative rods	Typical *E. coli* type	+	+	-	-
90	Negative rods	Typical *E. coli* type	+	+	-	-
91	Negative rods	Typical *E. coli* type	+	+	-	-
92	Negative rods	Typical *E. coli* type	+	+	-	-
93	Negative rods	Typical *E. coli* type	+	+	-	-
94	Negative rods	Typical *E. coli* type	+	+	-	-

TABLE IV -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utilization
95	Negative rods	Typical *E. coli* type	+	+	-	-
96	Negative rods	Typical *E. coli* type	+	+	-	-
97	Negative rods	Typical *E. coli* type	+	+	-	-
98	Negative rods	Typical *E. coli* type	+	+	-	-
99	Negative rods	Typical *E. coli* type	+	+	-	-
101	Negative rods	Typical *E. coli* type	+	+	-	-
102	Negative rods	Typical *E. coli* type	+	+	-	-
103	Negative rods	Typical *E. coli* type	+	+	-	-
104	Negative rods	Typical *E. coli* type	+	+	-	-
105	Negative rods	Typical *E. coli* type	+	+	-	-
106	Negative rods	Typical *E. coli* type	+	+	-	-
109	Negative rods	Typical *E. coli* type	+	+	-	-
110	Negative rods	Typical *E. coli* type	+	+	-	-
111	Negative rods	Typical *E. coli* type	+	+	-	-
113	Negative rods	Typical *E. coli* type	+	+	-	-
114	Negative rods	Typical *E. coli* type	+	+	-	-
115	Negative rods	Typical *E. coli* type	+	+	-	-
116	Negative rods	Typical *E. coli* type	+	+	-	-
117	Negative rods	Typical *E. coli* type	+	+	-	-

TABLE IV -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utilization
118	Negative rods	Typical *E. coli* type	+	+	-	-
119	Negative rods	Typical *E. coli* type	+	+	-	-
120	Negative rods	Typical *E. coli* type	+	+	-	-
121	Negative rods	Typical *E. coli* type	+	+	-	-
122	Negative rods	Typical *E. coli* type	+	+	-	-
123	Negative rods	Typical *E. coli* type	+	+	-	-
124	Negative rods	Typical *E. coli* type	+	+	-	-
125	Negative rods	Typical *E. coli* type	+	+	-	-

TABLE V

SUMMARY OF IDENTIFICATION REACTIONS USED FOR *AEROBACTER* ISOLATED FROM 71 CANINE ANAL SACS

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utilization	Gelatin Liquefaction
8	Negative rods	*Aerobacter* type	-	-	+	+	-
9	Negative rods	*Aerobacter* type	-	-	+	+	-
10	Negative rods	*Aerobacter* type	-	-	+	+	-
11	Negative rods	*Aerobacter* type	-	-	+	+	-
15	Negative rods	*Aerobacter* type	-	-	+	+	-
16	Negative rods	*Aerobacter* type	-	-	+	+	-
20	Negative rods	*Aerobacter* type	-	-	+	+	-
21	Negative rods	*Aerobacter* type	-	-	+	+	-
22	Negative rods	*Aerobacter* type	-	-	+	+	-
23	Negative rods	*Aerobacter* type	-	-	+	+	-
24	Negative rods	*Aerobacter* type	-	-	+	+	-
25	Negative rods	*Aerobacter* type	-	-	+	+	-
27	Negative rods	*Aerobacter* type	-	-	+	+	-
28	Negative rods	*Aerobacter* type	-	-	+	+	-
29	Negative rods	*Aerobacter* type	-	-	+	+	-
30	Negative rods	*Aerobacter* type	-	-	+	+	-
31	Negative rods	*Aerobacter* type	-	-	+	+	-
32	Negative rods	*Aerobacter* type	-	-	+	+	-

TABLE V -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utili-zation	Gelatin Lique-faction
33	Negative rods	Aerobacter type	-	-	+	+	-
34	Negative rods	Aerobacter type	-	-	+	+	-
35	Negative rods	Aerobacter type	-	-	+	+	-
36	Negative rods	Aerobacter type	-	-	+	+	±
37	Negative rods	Aerobacter type	-	-	+	+	-
38	Negative rods	Aerobacter type	-	-	+	+	-
39	Negative rods	Aerobacter type	-	-	+	+	±
40	Negative rods	Aerobacter type	-	-	+	+	±
41	Negative rods	Aerobacter type	-	-	+	+	±
42	Negative rods	Aerobacter type	-	-	+	+	±
43	Negative rods	Aerobacter type	-	-	+	+	±
46	Negative rods	Aerobacter type	-	-	+	+	±
47	Negative rods	Aerobacter type	-	-	+	+	±
48	Negative rods	Aerobacter type	-	-	+	+	±
49	Negative rods	Aerobacter type	-	-	+	+	±
50	Negative rods	Aerobacter type	-	-	+	+	±
51	Negative rods	Aerobacter type	-	-	+	+	±
56	Negative rods	Aerobacter type	-	-	+	+	±
58	Negative rods	Aerobacter type	-	-	+	+	±

TABLE V -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utilization	Gelatin Liquefaction
59	Negative rods	Aerobacter type	-	-	+	+	±
60	Negative rods	Aerobacter type	-	-	+	+	±
64	Negative rods	Aerobacter type	-	-	+	+	±
66	Negative rods	Aerobacter type	-	-	+	+	±
68	Negative rods	Aerobacter type	-	-	+	+	±
70	Negative rods	Aerobacter type	-	-	+	+	±
72	Negative rods	Aerobacter type	-	-	+	+	±
73	Negative rods	Aerobacter type	-	-	+	+	±
74	Negative rods	Aerobacter type	-	-	+	+	±
75	Negative rods	Aerobacter type	-	-	+	+	±
76	Negative rods	Aerobacter type	-	-	+	+	±
79	Negative rods	Aerobacter type	-	-	+	+	±
80	Negative rods	Aerobacter type	-	-	+	+	±
82	Negative rods	Aerobacter type	-	-	+	+	±
83	Negative rods	Aerobacter type	-	-	+	+	±
84	Negative rods	Aerobacter type	-	-	+	+	±
85	Negative rods	Aerobacter type	-	-	+	+	±
89	Negative rods	Aerobacter type	-	-	+	+	±
92	Negative rods	Aerobacter type	-	-	+	+	±

TABLE V -- Continued

Sample Number	Gram Stain	Colony Morphology on E.M.B.	Indole Production	Methyl Red Reaction	V. P. Reaction	Citrate Utilization	Gelatin Liquefaction
93	Negative rods	Aerobacter type	-	-	+	+	±
94	Negative rods	Aerobacter type	-	-	+	+	±
96	Negative rods	Aerobacter type	-	-	+	+	±
97	Negative rods	Aerobacter type	-	-	+	+	±
98	Negative rods	Aerobacter type	-	-	+	+	±
99	Negative rods	Aerobacter type	-	-	+	+	±
106	Negative rods	Aerobacter type	-	-	+	+	±
107	Negative rods	Aerobacter type	-	-	+	+	±
110	Negative rods	Aerobacter type	-	-	+	+	±
111	Negative rods	Aerobacter type	-	-	+	+	±
116	Negative rods	Aerobacter type	-	-	+	+	±
118	Negative rods	Aerobacter type	-	-	+	+	±
121	Negative rods	Aerobacter type	-	-	+	+	±
122	Negative rods	Aerobacter type	-	-	+	+	±
124	Negative rods	Aerobacter type	-	-	+	+	±

TABLE VI

SUMMARY OF PROTEUS IDENTIFICATION REACTIONS ISOLATED FROM 41 CANINE ANAL SACS

Sample Number	Gram Stain	Colony Morphology	Urea Utilization	Mannitol Fermentation	Sucrose Fermentation	Maltose Fermentation	Indole Production
66	Negative rods	Swarming with odor	+	-	-	-	-
67	Negative rods	Swarming with odor	+	-	-	-	+
68	Negative rods	Swarming with odor	+	-	-	-	+
69	Negative rods	Swarming with odor	+	-	-	-	+
70	Negative rods	Swarming with odor	+	-	-	-	+
71	Negative rods	Swarming with odor	+	-	-	-	+
73	Negative rods	Swarming with odor	+	-	-	-	+
74	Negative rods	Swarming with odor	+	-	-	-	+
76	Negative rods	Swarming with odor	+	-	-	-	+
77	Negative rods	Swarming with odor	+	-	-	-	+
79	Negative rods	Swarming with odor	+	-	-	-	+
80	Negative rods	Swarming with odor	+	-	-	-	+
81	Negative rods	Swarming with odor	+	-	-	-	+
82	Negative rods	Swarming with odor	+	-	-	-	+
83	Negative rods	Swarming with odor	+	-	-	-	+
84	Negative rods	Swarming with odor	+	-	-	-	+
85	Negative rods	Swarming with odor	+	-	-	-	+
87	Negative rods	Swarming with odor	+	-	-	-	+

TABLE VI -- Continued

Sample Number	Gram Stain	Colony Morphology	Urea Utilization	Mannitol Fermentation	Sucrose Fermentation	Maltose Fermentation	Indole Production
88	Negative rods	Swarming with odor	+	-	-	-	+
89	Negative rods	Swarming with odor	+	-	-	-	+
90	Negative rods	Swarming with odor	+	-	-	-	+
91	Negative rods	Swarming with odor	+	-	-	-	+
92	Negative rods	Swarming with odor	+	-	-	-	+
93	Negative rods	Swarming with odor	+	-	-	-	+
94	Negative rods	Swarming with odor	+	-	-	-	+
96	Negative rods	Swarming with odor	+	-	-	-	+
97	Negative rods	Swarming with odor	+	-	-	-	+
98	Negative rods	Swarming with odor	+	-	-	-	+
99	Negative rods	Swarming with odor	+	-	-	-	+
107	Negative rods	Swarming with odor	+	-	-	-	+
108	Negative rods	Swarming with odor	+	-	-	-	+
111	Negative rods	Swarming with odor	+	-	-	-	+
112	Negative rods	Swarming with odor	+	-	-	-	+
115	Negative rods	Swarming with odor	+	-	-	-	+
116	Negative rods	Swarming with odor	+	-	-	-	+
117	Negative rods	Swarming with odor	+	-	-	-	+
121	Negative rods	Swarming with odor	+	-	-	-	+

TABLE VI -- Continued

Sample Number	Gram Stain	Colony Morphology	Urea Utilization	Mannitol Fermentation	Sucrose Fermentation	Maltose Fermentation	Indole Production
122	Negative rods	Swarming with odor	+	-	-	-	+
123	Negative rods	Swarming with odor	+	-	-	-	+
124	Negative rods	Swarming with odor	+	-	-	-	+
125	Negative rods	Swarming with odor	+	-	-	-	+

TABLE VII

SUMMARY OF THE IDENTIFICATION REACTIONS USED FOR PSEUDOMONAS ISOLATED FROM 9 CANINE ANAL SACS

Sample Number	Gram Stain	Colony Morphology	H_2S Production	Indole Production	Motile	Fermentation			
						Dextrose	Lactose	Maltose	Mannitol
3	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
5	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
14	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
40	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
54	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
59	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
62	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
103	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-
104	Negative rods	Florescent with a green pigment	-	-	+	-	-	-	-

TABLE VIII

SUMMARY OF IDENTIFICATION REACTIONS FOR STAPHYLOCOCCI ISOLATED FROM 15 CANINE ANAL SACS

Sample Number	Gram Stain	Colony Morphology	$NH_4H_2PO_4$ Utilization	Gelatin Liquefaction	Mannitol Fermentation	Coagulase Production
1	Positive cocci	Large white	-	+	+	-
2	Positive cocci	Large white	-	+	+	-
5	Positive cocci	Large white	-	+	+	-
17	Positive cocci	Light white	-	-	-	-
19	Positive cocci	Large white	-	+	+	-
29	Positive cocci	Light white	-	-	-	-
33	Positive cocci	Large white	-	+	+	-
37	Positive cocci	Light white	-	-	-	-
38	Positive cocci	Large white	-	+	+	-
40	Positive cocci	Light white	-	-	-	-
50	Positive cocci	Large white	-	+	+	-
57	Positive cocci	Large white	-	+	+	-
86	Positive cocci	Large white	-	+	+	-
95	Positive cocci	Large white	-	+	+	-
100	Positive cocci	Large white	-	+	+	-

TABLE IX

THE OCCURRENCE OF MICROORGANISMS
ISCLATED FROM 44 FEMALE DOGS

	Microorganisms Isolated	Number of Cultures Isolated	Percent of Incidence
1.	Nonhemolytic enteric streptococci	31	70.5
2.	Alpha hemolytic enteric streptococci	2	4.5
3.	Beta hemolytic enteric streptococci	6	13.6
4.	Staphylococcus albus	7	15.9
5.	Staphylococcus epidermidis	0	0
6.	Escherichia coli	40	90.9
7.	Aerobacter	22	50.0
8.	Proteus morganii	26	59.1
9.	Yeasts, unidentified	16	34.0
10.	Pseudomonas aeruginosa	4	9.0

TABLE X

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 80 MALE DOGS

	Microorganisms Isolated	Number of Positive Cultures Isolated	Percent of Incidence
1.	Nonhemolytic enteric streptococci	55	68.8
2.	Alphe hemolytic enteric streptococci	4	5.0
3.	Beta hemolytic enteric streptococci	13	16.3
4.	*Staphylococcus albus*	4	5.0
5.	*Staphylococcus epidermidis*	4	5.0
6.	*Escherichia coli*	60	75.0
7.	*Aerobacter*	48	60.0
8.	*Proteus morganii*	63	78.8
9.	Yeasts, unidentified	20	25.0
10.	*Pseudomonas aeruginosa*	5	6.3

TABLE XI

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 72 WHITE TO LIGHT GRAY SAMPLES OF ANAL SAC FLUID

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	48	65.8
2.	Alpha hemolytic enteric streptococci	2	2.7
3.	Beta hemolytic enteric streptococci	13	18.1
4.	*Staphylococcus albus*	7	9.6
5.	*Staphylococcus epidermidis*	2	2.7
6.	*Escherichia coli*	39	80.0
7.	*Aerobacter*	43	59.7
8.	*Proteus morganii*	53	72.6
9.	Yeasts, unidentified	17	23.3
10.	*Pseudomonas aeruginosa*	0	0

TABLE XII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 16 BROWN SAMPLES OF ANAL SAC FLUID

	Microorganisms Isolated	Number of Positive Culture	Percent of Incidence
1.	Nonhemolytic enteric streptococci	12	75.0
2.	Alpha hemolytic enteric streptococci	1	6.3
3.	Beta hemolytic enteric streptococci	1	6.3
4.	*Staphylococcus albus*	3	18.8
5.	*Staphylococcus epidermidis*	1	6.3
6.	*Escherichia coli*	10	62.5
7.	*Aerobacter*	10	62.5
8.	*Proteus morganii*	9	56.3
9.	Yeasts, unidentified	5	31.3
10.	*Pseudomonas aeruginosa*	3	18.8

TABLE XIII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 10 GREEN SAMPLES OF ANAL SAC FLUID

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	7	70.
2.	Alpha hemolytic enteric streptococci	2	20.0
3.	Beta hemolytic enteric streptococci	2	20.0
4.	Staphylococcus albus	0	C
5.	Staphylococcus epidermidis	0	0
6.	Escherichia coli	6	60.0
7.	Aerobacter	4	40.0
8.	Proteus morganii	7	70.0
9.	Yeasts, unidentified	3	30.0
10.	Pseudomonas aeruginosa	4	40.0

TABLE XIV

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 27 GRAY SAMPLES OF ANAL SAC FLUID

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	20	74.1
2.	Alpha hemolytic enteric streptococci	1	3.7
3.	Beta hemolytic enteric streptococci	3	11.1
4.	*Staphylococcus albus*	1	3.7
5.	*Staphylococcus epidermidis*	1	3.7
6.	*Escherichia coli*	26	96.3
7.	*Aerobacter*	14	51.9
8.	*Proteus morganii*	21	77.8
9.	Yeasts, unidentified	11	40.7
10.	*Pseudomonas aeruginosa*	2	7.4

TABLE XV

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 21 DOGS OF THE HOUND CLASS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	18	85.7
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	2	9.5
4.	*Staphylococcus albus*	3	14.3
5.	*Staphylococcus epidermidis*	1	4.8
6.	*Escherichia coli*	20	95.2
7.	*Aerobacter*	14	66.7
8.	*Proteus morganii*	16	76.2
9.	Yeasts, unidentified	8	38.1
10.	*Pseudomonas aeruginosa*	3	14.3

TABLE XVI

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 46 DOGS OF THE SPORTING CLASS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	32	69.6
2.	Alpha hemolytic enteric streptococci	1	2.2
3.	Beta hemolytic enteric streptococci	9	19.6
4.	Staphylococcus albus	5	10.9
5.	Staphylococcus epidermidis	2	4.4
6.	Escherichia coli	40	87.0
7.	Aerobacter	29	63.0
8.	Proteus morganii	31	67.4
9.	Yeasts, unidentified	10	21.7
10.	Pseudomonas aeruginosa	1	2.2

TABLE XVII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 34 DOGS OF THE WORKING CLASS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	22	64.7
2.	Alpha hemolytic enteric streptococci	4	11.8
3.	Beta hemolytic enteric streptococci	4	11.8
4.	*Staphylococcus albus*	1	2.9
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	25	73.5
7.	*Aerobacter*	18	52.9
8.	*Proteus morganii*	24	70.6
9.	Yeasts, unidentified	8	23.5
10.	*Pseudomonas aeruginosa*	3	8.7

TABLE XVIII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 8 DOGS OF THE NON-SPORTING CLASS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	5	62.5
2.	Alpha hemolytic enteric streptococci	1	12.5
3.	Beta hemolytic enteric streptococci	2	25.0
4.	Staphylococcus albus	0	0
5.	Staphylococcus epidermidis	1	12.5
6.	Escherichia coli	6	75.0
7.	Aerobacter	5	62.5
8.	Proteus morganii	6	75.0
9.	Yeasts, unidentified	3	36.3
10.	Pseudomonas aeruginosa	1	12.5

TABLE XIX

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 5 DOGS OF THE TERRIER CLASS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	4	80.0
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	1	20.0
4.	*Staphylococcus albus*	0	0
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	4	80.0
7.	*Aerobacter*	2	40.0
8.	*Proteus morganii*	4	80.0
9.	Yeasts, unidentified	2	40.0
10.	*Pseudomonas aeruginosa*	0	0

TABLE XX

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 10 MONGREL DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	4	40.0
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	1	10.0
4.	*Staphylococcus albus*	2	20.0
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	4	40.0
7.	*Aerobacter*	2	20.0
8.	*Proteus morganii*	5	50.0
9.	Yeasts, unidentified	4	40.0
10.	*Pseudomonas aeruginosa*	1	10.0

TABLE XXI

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 21 ONE-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	13	61.9
2.	Alpha hemolytic enteric streptococci	1	4.7
3.	Beta hemolytic enteric streptococci	3	14.3
4.	*Staphylococcus albus*	1	4.7
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	16	76.2
7.	*Aerobacter*	9	42.9
8.	*Proteus morganii*	11	52.4
9.	Yeasts, unidentified	7	33.3
10.	*Pseudomonas aeruginosa*	1	4.7

TABLE XXII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 18 TWO-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	15	83.3
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	3	16.7
4.	*Staphylococcus albus*	0	0
5.	*Staphylococcus epidermidis*	1	5.6
6.	*Escherichia coli*	16	88.9
7.	*Aerobacter*	11	61.1
8.	*Proteus morganii*	11	61.1
9.	Yeasts, unidentified	5	27.8
10.	*Pseudomonas aeruginosa*	2	11.2

TABLE XXIII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 14 THREE-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	9	64.3
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	2	14.3
4.	*Staphylococcus albus*	2	14.3
5.	*Staphylococcus epidermidis*	1	7.1
6.	*Escherichia coli*	13	92.9
7.	*Aerobacter*	9	64.3
8.	*Proteus morganii*	10	71.5
9.	Yeasts, unidentified	2	14.3
10.	*Pseudomonas aeruginosa*	1	7.1

TABLE XXIV

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 12 FOUR-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	9	75.0
2.	Alpha hemolytic enteric streptococci	1	8.3
3.	Beta hemolytic enteric streptococci	2	16.7
4.	*Staphylococcus albus*	3	25.0
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	10	83.3
7.	*Aerobacter*	77	58.3
8	*Proteus morganii*	9	75.0
9.	Yeasts, unidentified	3	25.0
10.	*Pseudomonas aeruginosa*	0	0

TABLE XXV

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 13 FIVE-YEAR OLD DOGS

	Microorganisms Isolated	Numbers of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	10	76.9
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	3	23.1
4.	*Staphylococcus albus*	0	0
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	8	61.5
7.	*Aerobacter*	9	69.2
8.	*Proteus morganii*	11	84.6
9.	Yeasts, unidentified	3	23.1
10.	*Pseudomonas aeruginosa*	0	0

TABLE XXVI

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 11 SIX-YEAR OLD DOGS

	Microorganisms Isolated	Numbers of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	5	45.5
2.	Alphe hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	2	18.2
4.	*Staphylococcus albus*	1	9.1
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	9	81.8
7.	*Aerobacter*	10	91.0
8.	*Proteus morganii*	8	72.7
9.	Yeasts, unidentified	5	45.5
10.	*Pseudomonas aeruginosa*	0	0

TABLE XXVII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 12 SEVEN-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	9	75.0
2.	Alpha hemolytic enteric streptococci	3	25.0
3.	Beta hemolytic enteric streptococci	2	16.7
4.	Staphylococcus albus	0	0
5.	Staphylococcus epidermidis	1	8.3
6.	Escherichia coli	9	25.0
7.	Aerobacter	6	50.0
8.	Proteus morganii	10	83.3
9.	Yeasts, unidertified	2	16.7
10.	Pseudomonas aeruginosa	1	8.3

TABLE XXVIII

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 8 EIGHT-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	5	62.5
2.	Alpha hemolytic enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	1	12.5
4.	Staphylococcus albus	0	0
5.	Staphylococcus epidermidis	1	12.5
6.	Escherichia coli	7	87.5
7.	Aerobacter	3	27.3
8.	Proteus morganii	7	87.5
9.	Yeasts, unidentified	3	27.3
10.	Pseudomonas aeruginosa	1	12.5

TABLE XXIX

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 5 NINE-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	3	60.0
2.	Alpha hemolytic ent enteric streptococci	0	0
3.	Beta hemolytic enteric streptococci	0	0
4.	Staphylococcus albus	2	40.0
5.	Staphylococcus epidermidis	0	0
6.	Escherichia coli	5	100.0
7.	Aerobacter	3	60.0
8.	Proteus morganii	4	80.0
9.	Yeasts, unidentified	2	40.0
10.	Pseudomonas aeruginosa	0	0

TABLE XXX

THE OCCURRENCE OF MICROORGANISMS ISOLATED FROM 5 TEN-YEAR OLD DOGS

	Microorganisms Isolated	Number of Positive Cultures	Percent of Incidence
1.	Nonhemolytic enteric streptococci	5	100.0
2.	Alpha hemolytic enteric streptococci	1	20.0
3.	Beta hemolytic enteric streptococci	1	20.0
4.	*Staphylococcus albus*	0	0
5.	*Staphylococcus epidermidis*	0	0
6.	*Escherichia coli*	4	80.0
7.	*Aerobacter*	2	40.0
8.	*Proteus morganii*	4	80.0
9.	Yeasts, unidentified	1	20.0
10.	*Pseudomonas aeruginosa*	1	20.0

Antibiotic Number	Antibiotic	Dosage
1	neomycin	5 mcg
2	penicillin	2 units
3	polymyxin B	5 mcg
4	terramycin	5 mcg
5	tetracycline	5 mcg
6	triple sulfa	.25 mgm
7	erythromycin	2 mcg
8	dihydrostreptomycin	10 mcg
9	chloromycetin	5 mcg
10	carbomycin	2 mcg
11	bacitracin	2 units
12	aureomycin	5 mcg

Value	Radius in mm.	Interpretation
+	3	slight
++	6	moderate
+++	9	good
++++	12	very good

TABLE XXXI

A SUMMARY OF ANTIBIOTIC SENSITIVITY STUDIES ON THE BACTERIAL FLORA OF 21 CANINE ANAL SACS

Sample Number	Hours of Examination from time of Inoculation	1	2	3	4	5	6	7	8	9	10	11	12
93	12 hours	0	C	0	C	0	C	C	+	++	0	0	0
	24 hours	+	0	0	0	0	C	0	+	++	0	0	C
	36 hours	+	0	C	C	C	0	0	+	++	0	0	0
	48 hours	+	0	C	C	0	0	C	0	++	0	0	0
94	12 hours	++	0	0	0	0	C	0	+++	+++	0	0	C
	24 hours	+++	0	0	C	C	0	0	+++	+++	0	0	C
	36 hours	+++	0	0	0	C	0	0	+++	+++	0	0	0
	48 hours	+++	0	0	0	C	C	0	+++	+++	0	C	0
95	12 hours	++	0	+	++	+	+	0	+++	++++	0	C	+
	24 hours	++	0	++	++	+	+	0	+++	++++	0	C	+
	36 hours	+++	0	+++	++	+	+	0	+++	++++	0	0	+
	48 hours	+++	0	+++	++	+	0	0	+++	++++	0	0	0
97	12 hours	++	0	0	0	0	C	C	+++	+	0	0	0
	24 hours	++	0	0	0	0	C	0	+++	+	0	0	0
	36 hours	++	0	0	0	0	0	0	+++	+	0	0	0
	48 hours	+++	0	0	C	0	0	C	+++	+	0	0	0
98	12 hours	++	0	+++	+	+	0	0	+	+++	0	0	+
	24 hours	++	0	+++	+	+	0	0	+	+++	0	0	+
	36 hours	++	0	+++	+	+	0	0	++	+++	0	0	+
	48 hours	++	0	+++	+	+	0	0	++	+++	0	0	C
99	12 hours	+++	0	0	0	0	0	0	++	+++	0	0	0
	24 hours	+++	0	0	0	0	0	0	++	+++	0	0	0
	36 hours	+++	0	0	0	0	0	0	++	+++	0	0	0
	48 hours	+++	0	0	0	0	0	0	+++	++	0	0	0
101	12 hours	0	0	0	+++	+++	0	0	0	C	++	++	+++
	24 hours	0	0	0	+++	+++	0	C	C	0	++	++	+++
	36 hours	0	0	0	++	++	0	0	C	C	++	++	+++
	48 hours	0	0	C	++	++	0	0	C	C	++	++	+++
102	12 hours	++	0	0	++	++	++	0	+++	+++	0	0	0
	24 hours	++	0	0	++	++	++	0	+++	+++	0	0	0
	36 hours	++	0	0	++	++	0	0	+++	+++	0	0	0
	48 hours	+++	0	C	++	++	0	0	+++	+++	0	0	C
103	12 hours	0	0	C	+	0	+++	0	0	0	0	0	C
	24 hours	0	0	0	+	0	+++	0	C	0	0	C	0
	36 hours	0	C	C	+	0	++	0	C	0	0	0	C
	48 hours	0	0	0	+	0	++	0	C	0	0	C	0

TABLE XXXI -- Continued

Sample Number	Hours of Examination from time of Inoculation	1	2	3	4	5	6	7	8	9	10	11	12
104	12 hours	0	0	++	++	0	+++	0	0	0	0	0	0
	24 hours	0	0	++	++	0	+++	0	0	0	0	0	0
	36 hours	0	0	++	0	0	0	0	0	0	0	0	0
	48 hours	0	0	++	0	0	0	0	0	0	0	0	0
105	12 hours	++++	0	++	++	+++	0	0	++++	+++	0	0	0
	24 hours	++++	0	++	++	+++	0	0	++++	+++	0	0	0
	36 hours	++++	0	++	0	0	0	0	++++	+++	0	0	0
	48 hours	++++	0	++	0	0	0	0	++++	+++	0	0	0
106	12 hours	0	0	0	0	0	0	0	0	+++	0	++	++
	24 hours	0	0	0	0	0	0	0	0	+++	0	++	++
	36 hours	0	0	0	+++	+++	0	0	0	+++	0	++	+++
	48 hours	0	0	0	+++	+++	0	0	0	+++	0	++	+++
107	12 hours	+++	0	0	0	0	+++	0	+++	0	0	0	0
	24 hours	+++	0	0	0	0	+++	0	+++	0	0	0	0
	36 hours	+++	0	0	0	0	+++	0	+++	+	0	0	0
	48 hours	+++	0	0	0	0	+++	0	+++	+	0	0	0
108	12 hours	0	0	+	0	0	0	0	+	+	0	0	0
	24 hours	0	0	+	0	0	0	0	+	+	0	0	0
	36 hours	0	0	+	0	0	0	0	+	0	0	0	0
	48 hours	0	0	+++	0	0	0	0	+	0	0	0	0
109	12 hours	0	0	0	+++	+++	0	0	0	+++	+	+	+++
	24 hours	0	0	0	+++	+++	0	0	0	+++	+	+	+++
	36 hours	0	0	0	+++	+++	0	0	0	+++	0	0	+++
	48 hours	0	0	0	+++	+++	0	0	0	+++	0	0	+++
110	12 hours	+	0	+	+	+	+	0	+	+	0	0	+
	24 hours	+	0	+	+	+	+	0	+	+	0	0	+
	36 hours	0	0	+	0	0	0	0	+	+	0	0	+
	48 hours	0	0	+	0	0	0	0	+	+++	0	0	+
111	12 hours	0	0	0	0	0	0	0	0	0	0	0	0
	24 hours	0	0	0	0	0	0	0	0	0	0	0	0
	36 hours	+	0	0	0	0	0	0	+	0	0	0	0
	48 hours	+	0	0	0	0	0	0	+	0	0	0	0
112	12 hours	0	0	0	0	0	0	0	+	0	0	0	0
	24 hours	0	0	0	0	0	0	0	+	0	0	0	0
	36 hours	0	0	0	0	0	0	0	0	0	0	0	0
	48 hours	0	0	0	0	0	0	0	0	0	0	0	0
113	12 hours	+++	+	+	+++	+++	+++	+++	+++	+	0	0	+
	24 hours	+++	+	+	+++	+++	+++	+++	+++	+	0	0	+
	36 hours	+++	+	+	+++	+++	+++	+++	++++	0	0	0	+
	48 hours	+++	+	+	+++	+++	+++	+++	++++	0	0	0	+

TABLE XXXI -- Continued

Sample Number	Hours of Examination from time of Inoculation	1	2	3	4	5	6	7	8	9	10	11	12
114	12 hours	0	+++	0	+++	0	0	0	0	0	+++	+++	0
	24 hours	0	+++	0	+++	0	0	0	0	0	+++	+++	0
	36 hours	0	+++	0	0	0	0	0	0	0	0	0	0
	48 hours	0	+++	0	0	0	0	0	0	0	0	0	0
115	12 hours	+	0	0	0	0	+++	0	+++	+	0	0	0
	24 hours	+	0	0	0	0	+++	0	+++	+	0	0	0
	36 hours	0	0	0	0	0	++	0	++	+	0	0	0
	48 hours	0	0	0	0	0	++	0	++	0	0	0	0

TABLE XXXII

A SUMMARY OF THE BACTERIAL FLORA OF 21 CANINE ANAL SACS FOR WHICH ANTIBIOTIC SENSITIVITY DETERMINATIONS WERE MADE

Sample Number	Nonhemolytic enteric streptococci	Alpha hemolytic enteric streptococci	Beta hemolytic enteric streptococci	Staphylococcus albus	Staphylococcus epidermidis	Escherichia coli	Aerobacter sp.	Proteus morganii	Unidentified Yeasts	Pseudomonas aeruginosa
93	+	-	-	-	-	+	+	+	-	-
94	-	-	-	-	-	+	+	+	-	-
95	+	-	-	+	-	+	-	-	+	-
97	+	-	-	-	-	+	+	+	-	-
98	+	-	-	-	-	+	+	+	-	-
99	+	-	-	-	-	+	+	+	+	-
101	+	-	+	-	-	+	-	-	-	-
102	+	-	-	-	-	+	-	-	+	-
103	+	-	+	-	-	+	-	-	+	+
104	-	+	-	-	-	+	-	-	-	-
105	+	-	-	-	-	+	-	-	+	-
106	-	-	+	-	-	+	+	-	-	-
107	-	-	+	-	-	-	+	+	-	-
108	-	+	+	-	-	-	-	+	-	-
109	+	-	+	-	-	+	-	-	-	-
110	+	-	+	-	-	+	+	-	-	-
111	-	-	+	-	-	+	+	+	-	-
112	+	-	+	-	-	-	-	+	-	-
113	+	-	+	-	-	+	-	-	-	-
114	+	+	+	-	-	+	-	+	-	+
115	+	-	-	-	-	+	-	-	-	-

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