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National Animal Disease Center

Guidelines and Bibliography

Agricultural Reviews and Manuals
Science and Education Administration
U.S. Department of Agriculture

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INTRODUCTORY REMARKS

THE NATIONAL ANIMAL DISEASE CENTER

The United States Department of Agriculture established the National Animal Disease Center on July 27, 1956, when President Dwight D. Eisenhower signed the appropriation bill containing the $16,250,000 to construct the new laboratory. The mission of the Center was, and continues to be, to conduct basic and applied research on the diseases of livestock and poultry of major economic importance to agriculture. Its staff of approximately 350 employees is committed to excellence in veterinary research and to an interdisciplinary approach to finding solutions to animal health problems. Efforts of the Center's 60 research scientists are devoted to the study of approximately 30 diseases or disease complexes affecting cattle, swine, poultry, sheep, horses and other animals. This strong and broadly based intramural research program is supplemented by an extensive extramural program of research projects at 24 U.S. universities supported in part by Agency funds. In addition, cooperative research is also in progress with veterinary research colleagues in Egypt, India, and Pakistan.

This report of the research program of the National Animal Disease Center is prepared and disseminated to interested colleagues throughout the world to foster scientific understanding and to stimulate the interaction so necessary among those who have chosen to serve man and his animals.

P. A. O'Berry, Director
National Animal Disease Center
Ames, Iowa

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BACTERIOLOGICAL AND MYCOLOGICAL
RESEARCH LABORATORY

AC Pier, DVM, PhD, Dipl ACVM--Chief
Teri D McClannahan--Secretary

Scientists in the Bacteriological and
Mycological Research Laboratory at the
National Animal Disease Center (NADC)
conduct original and meaningful
research on diseases of food-producing
animals that are caused or mediated by
bacterial or fungal agents. Research
projects encompass studies emphasizing
agents and agent-host interactions.
Studies of the agent include iso-
lation, identification, nutrition,
metabolism, antigenic and chemical
analysis, and taxonomy. Studies
emphasizing agent-host interaction
include aspects of infection, disease,
intoxication, epizootiology, patho-
genesis, immunology, and chemotherapy.
Research objectives are to develop
sufficient knowledge on new diseases
on which to base program diagnosing,
controlling, or eradicating estab-
lished diseases that cause significant
losses in livestock and poultry
production.

BOVINE MASTITIS

RW Brown, DVM, PhD, Dipl ACVM
JS McDonald, DVM, PhD, Dipl ACVM
MN Mickelson, PhD
AJ Anderson, Technician
JW Moran (NRC Postdoctoral Fellow)

Cows vary in susceptibility to intra-
mammary infections and the development
of mastitis. NADC studies are in-
volved in defining the factors that
cause these differences to develop
methods for enhancing the cow's
resistance. Previous studies show
that glands with wide teat canals, as
determined by radiography, are more
susceptible to infections and that
there is a progressive dilation of the
teat canal with age. Present lines of
research are concerned with (1)
defining the susceptibility of the
udder to new infections during the
nonlactating period by injecting
strains of streptococci, staphylo-
cocci, and coliforms into the mammary
gland through the teat canal at
various intervals of the dry period;

This research is responsible for
investigating bovine mastitis, tuber-
culosis and paratuberculosis, ocular
diseases including infectious bovine
keratoconjunctivitis (pinkeye) and
ultraviolet irradiation, brucellosis,
leptospirosis, and reproductive
diseases; contagious equine metritis;
swine erysipelas, dysentery, strepto-
coccal lymphadenitis, and mycobac-
teriosis; fowl cholera of chickens and
turkeys, and turkey airsacculitis.
Investigations of mycoses and myco-
toxicoses include studies in swine,
cattle and poultry. The research of
this laboratory is included in 23
intramural CRIS units and 22 extra-
mural cooperative and 4 PL-480 agree-
ments, in addition to informal
collaborative studies.

Senior scientific staff from the
Laboratory make additional contribu-
tions to the scientific community
through teaching, lecturing, acting as
graduate advisors, participating on
specialty boards and on national and
international committees involved with
their specific area of expertise.
Isolating effect of Streptococcus agalactiae in milk and nutritive properties of milk for pathogenic organisms may provide the fundamental information necessary for future research on influencing a cow's resistance to mastitis by altering the concentration of specifically active compounds in milk through the cow's diet.

Key Publications


Current Publications


BOVINE BRUCELLOSIS

Staff:
BL Deyoe, DVM, PhD
TA Dorsey, DVM
JB Patterson, BS
M Phillips, PhD
LB Tabatabai, PhD
LA Garrett, BS
KB Meredith, Technician

Investigations in this project are directed toward developing methods and knowledge that will benefit improved control of and eliminate brucellosis in cattle and swine. Current specific objectives are (1) evaluating immunogenicity and postvaccinal responses of cattle of various ages to reduced dosages of live strain 19 vaccine, thereby seeking to improve and expand use of currently available vaccine;
(2) fractionating, isolating, and characterizing antigenic components of Brucella abortus to improve diagnostic methods by developing more specific test systems; (3) developing an effective nonvi able cell-fraction vaccine for use where live vaccine is contraindicated; and (4) identifying and characterizing nonlipopolysaccharide toxins of B. abortus to develop greater knowledge of the pathogenesis of the disease. This project also has cooperative agreements with 14 universities active in working on various aspects of brucellosis.

Current Publications


REPRODUCTIVE DISEASES OF CATTLE
Staff:
DE Hughes, DVM, MS, Dipl ACVM
OH Stalheim, DVM, PhD
JH Bryner, PhD
JW Foley, Technician
ME Eimers, BS

This research is in progress in three areas (1) maternal and fetal responses to infections of the bovine genital tract, (2) effects of mycoplasmas, and (3) bacterial infections on bovine reproduction. The first looks for new causes of abortion and infertility in cattle, such as sarcocystis and toxoplasmosis, and is concerned with the newly recognized venereal disease of horses known as contagious equine metritis. The results indicate that sarcocystis may be a significant part of current losses, and epidemiology studies are under way.

Mycoplasmas are smaller than bacteria and lack cell walls. They are common inhabitants of the bovine genital tract. Although they can cause reproductive diseases in cows and bulls, how much and under what circumstances remains to be defined. The ureaplasmas and spiroplasmas are related organisms whose disease potential is under study.

Research is in progress to improve sampling and culturing techniques for diagnosing Campylobacter fetus infection in cattle. Methods currently on trial include collecting samples from infected animals at the

D. E. Hughes, M. E. Eimers, J. H. Bryner, J. W. Foley, O.H.V. Stalheim (clockwise)
farm, inoculating selective-enrichment transport mediums, incubating the cultures in the laboratory, and identifying the pathogenic bacterium in the culture by direct and indirect immunofluorescent microscopy, immunoelectron microscopy, and biochemical testing. Other studies involve improving campylobacter bacterins through testing for optimum antigenic quality and quantity and adjuvants using a pregnant guinea pig protection test and correlating this test in cattle. Another study area involves determining the relatedness of \textit{C. fetus} isolants from animals with isolants from cases of the human disease for epidemiologic purposes. Bacteriophage testing correlated with serology is used to determine relatedness of strains.

\textbf{Current Publications}


\textbf{LEPTOSPIROSIS OF CATTLE}

\textbf{Staff:}
HC Ellinghausen, PhD
CA Belzer, BS
AB Thiermann, DVM, PhD

Two areas of emphasis in the leptospirosis research project are studies of the agent and host interactive processes.

Before 1975, we directed our attention to developing (1) the basic nutrition of the leptospires, (2) their maintenance in the laboratory, (3) the preservation of their antigenic, immunogenic, and virulence properties,
and (4) their lethal and infective characteristics for animals.

In 1975, we redirected our efforts because of an increasing need for information about the 37 member Hebdomadis serogroup. Characteristics of the immune response of cattle were determined for *Leptospira hardjo*, and it was determined that cattle consistently could be experimentally infected. Cross-agglutinating activity of these cattle sera and the early and late antibody response have been studied and reported. Remaining to be investigated with these materials were (1) the chronological development of protective antibodies, (2) the cross absorption of agglutinins, and (3) the distribution of IgM and IgG antibody. Cattle were inoculated with diverse groups of leptospires, and similar studies to those with *L. hardjo* are being carried out to gain a more complete picture of sero-reaction of cattle and the rapidity, duration, and nature of the immune response.

Another avenue of investigation involves developing procedures that optimize conditions for isolating leptospires from bovine urine. Areas currently being investigated include (1) the role of urinary solutes in the toxicity of bovine urine for leptospires, (2) use of furosemide to obtain urinary samples to isolate leptospires, and (3) comparison of physical, biochemical, and immunological characteristics of bovine urine before and after experimental infection with serovar hardjo.

**Key Publications**


INFECTIOUS BOVINE KERATOCONJUNCTIVITIS (PINKEYE) OF CATTLE

Staff:
GW Pugh, Jr, DVM, PhD
KE Kopecky, DVM, MS
TJ McDonald, BS
VD Schultz, Technician

Infectious bovine keratoconjunctivitis (IBK), or "pinkeye," is a highly contagious disease of cattle caused by Moraxella bovis. Pinkeye is a major cattle disease causing economic loss through slower calf growth, slower weight gain in feeder cattle, reduced milk yields from dairy cattle, treatment costs, as well as eye disfigurement and sometimes blindness. The disease occurs perennially in all cattle-raising areas. It usually appears during the early summer, which is the time of both maximum solar ultraviolet radiation and maximum fly population. Both of these factors are important in the etiology of the disease.

The investigational approach to control IBK being pursued involves applying such immunologic techniques as the development and use of polyvalent vaccines, as well as highly immunogenic fractions and strains of M. bovis. Also, using passive immunity as a source of protection for young calves (the most susceptible age) is being studied by vaccinating pregnant cows to stimulate protective colostral antibodies to protect the neonatal calves from IBK and to eliminate the carrier state in the dam (a major source of new infection). Because different strains of M. bovis differ in their antigenic character-


Current Publications


istics, single strain vaccines might not be effective in protecting cattle herds where multiple strain infections are likely. This would necessitate using polyvalent vaccines or an immunogen that would give a broad range of cross reactivity (protection). Possibly, such an immunogen would be an adjuvanted surface fraction of M. bovis. The fact that adjuvanted whole cells and surface fractions of M. bovis were efficient inducers of an immune response with reduced doses supports our contention that this research area might offer a method of pinkeye control under certain conditions. Controlling IBK with antimicrobial agents is also being studied to determine whether M. bovis can be eliminated from infected cattle (including carriers). Little is known about the carrier state at present; therefore, research in this area is of paramount importance.

Success in this research will lead to increased amounts of beef and dairy products and at the same time reduce the production cost. In this way, it will benefit the producer as well as the consumer.

Key Publications


Current Publications


PARATUBERCULOSIS OF CATTLE

Staff:
AB Larsen, DVM, MS
RS Merkal, PhD
AM Hintz, MS
DL Whipple, BS

Methods are being studied to immune cattle against paratuberculosis with nonliving vaccines. They include determining size of dose, age, vaccinating, and proper adjuvant. Both virulent and nonvirulent strains of Mycobacterium paratuberculosis are being evaluated. Procedures for determining the efficacy and potency of the vaccines before they leave the laboratory are being developed. Hamsters and lemmings are being investigated to determine if either of these species can be used for evaluating the immunizing agents.

The effect of chemotherapeutics on M. paratuberculosis in vitro is being evaluated by two measurements (1) incorporating 3H-uracil into RNA and (2) colony counts following diffusion through agar. Chemotherapeutics exhibiting adverse effects on the organism in vitro will be evaluated in orally-infected hamsters.

The serologic identification of paratuberculous cattle will be examined employing protoplasmic fractions as antigens, in gel diffusion precipitin, and counterimmunoelectrophoretic precipitin tests.

Iron chelators, such as mycobactins and nocobactins, of mycobacteria and related genera, will continue to be isolated and characterized in an effort to develop species-specific antimicrobial compounds.

Key Publications


Current Publications


MYCOBACTERIOSIS OF SWINE

Staff:
AB Larsen, DVM, MS
RS Merkal, PhD
AM Hintz, MS
DL Whipple, Technician

Epizootiological studies are being made of swine herds affected with mycobacteriosis to determine the cause and the environmental sources of infection. Studies are in progress to develop measures for eliminating the disease on affected premises.

Because most tuberculosis found in swine is caused by the Mycobacterium avium complex, the effect of chemotherapeutics on M. avium in vitro is being evaluated. Two measurements are being used (1) incorporating 3H-uracil into RNA and (2) colony counts following diffusion through agar. Chemotherapeutics exhibiting adverse effects on the organism in vitro will be evaluated in artificially infected laboratory animals.

The time-temperature treatments of meat products needed to destroy the tubercle bacilli (M. avium complex, which occur in swine, will be determined. This includes the production of weiners and other luncheon meats spiked with laboratory cultured organisms and with lesions obtained from swine at slaughter. These products are processed following varying protocols, then examined culturally for the numbers of organisms destroyed.

SWINE ERYSIPELAS

Staff:
RL Wood, DVM, PhD
DR Haubrich, BS

This project is concerned with investigations of epizootiology and pathogenesis of swine erysipelas. Studies have been made to determine the role of carrier swine and factors of external environment in maintenance and spread of the causative organism, Erysipelothrix rhusiopathiae. Current studies are concerned with serotype specificity in immunity of swine to the organism. Specific lack of immunity of vaccinated swine to certain strains of E. rhusiopathiae is being investigated. Statistical studies are being conducted in mice to determine whether there is evidence that the refractory response of

R. L. Wood, D. R. Haubrich (left to right)
certain strains of the organism to immunity induced by standard erysipelas vaccine is related to their serotypes. New serotypes of the organism are being characterized, and studies to determine their stability are being made. Using the refractory strains as tools to provide comparison with more conventional strains of the organism, studies will be made to investigate the role of cell-mediated immunity in swine erysipelas.

Key Publications


Current Publications


STREPTOCOCCIC LYMPHADENITIS OF SWINE (JOWL ABScesses)

Staff:
RL Wood, DVM, PhD
GE Wessman, PhD
NA Nord, Technician

Investigations in this project focus mainly on studies of antigens of group E Streptococci (GES) that cause streptococcic lymphadenitis of swine. The objective is to identify and characterize those antigens possessing important determinants of virulence and immunogenicity. The ultimate aim is to incorporate such an antigen(s) into diagnostic tests or into vaccines. Because group and type antigens have not been demonstrated to be of immunogenic or pathogenic significance, recent investigations have emphasized studies on an M-like protein antigen. This antigen is produced when GES are cultured in media supplemented with serum; the appearance of the antigen correlates with the development of resistance to phagocytosis by the GES. Antibodies to this antiphagocytic factor can be detected in hyperimmune and immune swine sera by means of bactericidal or long-chain tests. Attempts to isolate and purify this antigen are being made.
Immunization studies are being conducted involving swine given GES cellular extracts containing M-like protein to determine whether protection against the disease is conferred. Immunizing swine with concentrated whole-culture Al(OH)₃-adsorbate bacterins is also being attempted, with challenge provided by contact exposure to carrier swine.

Type antigens of the three recognized serotypes of GES are being further identified and characterized.

Current Publication

SWINE DYSENTERY

Staff:
LA Joens, PhD
DH Baum, MS

Basically, three areas of research are included in this project (1) serodiagnosis of swine dysentery, (2) examining the predisposing factors leading to the disease, and (3) developing an immunizing program against the disease. Recent work in serodiagnosis of the disease has led to the development of a microtitration agglutination test that uses inactivated Treponema hyodysenteriae antigen and enables researchers to measure agglutinins in swine serum macroscopically. This test appears to be specific for antibody to the pathogenic isolates of T. hyodysenteriae and demonstrates a significant level of antibody in convalescent pigs up to 10 to 11 weeks postinfection.

Future investigations will include more work on local antibody produced in both the convalescent and hyper-immunized pig to T. hyodysenteriae. Isolating membrane-associated complexes to T. hyodysenteriae will also be examined, along with the role that these complexes have in expressing the organism's pathogenicity.

Key Publications

Pig immunity to swine dysentery has been examined through convalescent swine models. Our studies have shown that reexposed pigs, as long as 17 to 18 weeks postinfection, were resistant to rechallenge. Agglutinating antibody specific for T. hyodysenteriae was demonstrated in colonic washings of reexposed pigs; fractionating one colonic washing sample demonstrated the antibody activity in the IgG fraction.
Current Publications


MYCOSES AND MYCOTOXISES

Staff:
AC Pier, DVM, PhD, Dipl ACVM
JL Richard, PhD
JR Thurston, PhD
RE Fichtner, BS
CD Anderson, Technician

Two major types of diseases caused by fungal agents are being investigated: the mucoses and the mycotoxicoses. The mucoses are fungal infections that invade, multiply, and grow fungal pathogens in host tissues. Aspergillosis is the mycosis causing the greatest economic loss in livestock and poultry. Research in our mycology unit on aspergillosis emphasizes elucidating the pathogenesis of mycotic abortion in ruminants caused by Aspergillus fumigatus and studying respiratory aspergillosis in poultry and rabbits caused by A. fumigatus and other aspergilli. Reproducible oral and aerosol exposure techniques are used for livestock, poultry, and laboratory animals. Serologic tests for antibodies to A. fumigatus have been devised and correlated with
development of lesions and disease states to facilitate diagnosis. Current studies of aspergillosis immunity are in progress. Other mycoses studies in our unit include nocardiosis and dermatophilosis, and developing diagnostic methods is the primary objective.

The mycotoxicoses represent a newly recognized and important area of interest in veterinary medicine. The mycotoxins are metabolites of certain fungi that grow on animal feeds. These metabolites cause acute and chronic disease processes of substantial economic importance. In addition to overt clinical disease, we have shown that some mycotoxins reduce the growth rate of swine, cattle and poultry; impair immunogenesis; and lower native resistance to some infections. These latter effects may occur at levels of toxin intake below those causing overt clinical disease. Our current research emphasis on mycotoxins is to determine the biological effects of consumption of selected toxins in poultry, swine, and cattle. Toxins receiving major emphasis include aflatoxin, ochratoxin A, penitrem A, and T-2 toxin. These and other mycotoxins are sought in specific disease episodes in commercial herds and flocks.

Key Publications


Current Publications


Cysewski SJ. The chemistry of the tremorgenic mycotoxins. In: Myco-
toxic Fungi, Mycotoxins and Myco-

Cysewski SJ. The effects of tremor-

Cysewski SJ. The effects of tremor-
genic mycotoxins in cattle. In: Mycotoxicoses of Domestic and Labora-


PASTEURELLOSIS (FOWL CHOLERA)

Staff:
KR Rhoades, DVM, PhD
RB Rimler, PhD
KA Brogden, MS
WE Brown, BS

Research on fowl cholera is currently directed toward preventing disease by improving vaccine effectiveness and serotyping techniques.

Efforts to improve vaccines include (1) studying the effectiveness of vaccines prepared from specific immunotypes of Pasteurella multocida, cultivated in a variety of environments, for inducing protection against challenge with either homologous or heterologous immunotypes; and (20 studying various components of P. multocida to determine their biochemical nature, antigenicity, immunogenicity, and toxicity to gain knowledge of the role of these components both as protective antigens and as contributors to pathogenicity.

Efforts to improve serotyping techniques are concerned with improving the gel-diffusion-precipitin test. Studies are under way to improve specificity and sensitivity of the
typing antigens and serums. We use this test to evaluate large numbers of field isolates to determine the distribution of serotypes and to search for additional serotypes.

Key Publications


Current Publications


TURKEY AIRSACCULITIS

Staff:
KR Rhoades, DVM, PhD
JE Gallagher, BS
LL Ferguson, Technician

Research in this project is concerned primarily with turkey airsacculitis resulting from mycoplasmal infections. Emphasis is currently directed toward two objectives (1) improving methods for diagnosing infections with recognized pathogens; and (2) evaluating the importance of organisms, which are questionable so far as pathogenicity for turkeys is concerned.
Studies to improve diagnostic methods are concerned with serologic testing for specific antibody. The relationship between the results obtained with different types of tests and the predominating immunoglobulin class of which the specific antibody is composed are being studied, as is the particular type of antigen(s) that stimulate production of antibody detectable by the commonly used tests. A better understanding of these factors is expected to contribute toward explaining variations in test results; which often occur.

Studies to evaluate potential pathogenicity of mycoplasmas other than the currently recognized pathogens are being conducted with strains of the I-J-K-N-Q-R group. The ability of these organisms to produce airsacculitis, their transmissibility, their stimulation of antibody production, and their within-group antigenic, morphologic, and biochemical relationships are being studied.

**Key Publications**


**Current Publications**


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**BIOCHEMISTRY AND BIOPHYSICS RESEARCH LABORATORY**

AE Ritchie, MS--Acting Chief  
MO Bornmueller--Secretary

This laboratory has a broad diversified program in close cooperation with scientists in the other laboratories of NADC. One function is to study the various aspects of the immune response of domestic animals toward bacterial, viral, and other immunogens and toxins. Concurrently, studies are directed toward isolating and characterizing various toxins, pathogens, and the associated immunogenic antigens by biochemical, biophysical, and immunological methods. Other areas include clinical chemical research directed to detect and characterize changes in amniotic and allantoic fluid during episodes of disease terminating in abortion.

Some senior members hold staff appointments at Iowa State University, Department of Biochemistry and Biophysics, and Immunobiology. This permits them to offer special courses at the NADC and to act as advisors for graduate students pursuing Master of Science or Doctor of Philosophy degrees.
MICROBIAL SECTION

Staff:
GW Engstrom, PhD
D McDorman, MS
JM Patterson, BS
AE Ritchie, MS
J Tindall, BS

Research is directed toward isolating, purifying, and characterizing toxic and other bacterial and fungal metabolites and studying their effects on selected biochemical systems from animal tissue or microbial culture. A toxic cyclic peptide lactone, roseotoxin B, has been characterized using ion-exchange chromatography, mass spectroscopy, and proton and Carbon-13 NMR spectroscopy. Other studies have involved high pressure liquid chromatography for analyzing rubratoxin B and other mycotoxins.

High resolution electron microscopy (Philips EM-200) is used to obtain morphological data on both bacteria and viruses. For bacteria, the main research objectives are to (1) characterize the microbial populations of various ecological niches; (2) establish taxonomically significant ultrastructural markers; (3) determine the occurrence of bacteriophages or their gene products in bacterial cultures and ascertain their effect on the physiological condition and pathogenicity of the host organism or
both; and (4) apply direct immuno-electron microscopy for differentiating closely related organisms and assessing the expression of capsular, endotoxic, or bacteriophage genes.

For viruses, the current emphasis is on determining the details of morphogenesis of those viruses that replicate by means of a "viroplasm," for example, adeno-, reo-, picodna- and picornaviruses. The objective is to obtain insight into the possibility of a common model of capsid assembly.

Key Publications


Current Publications


Investigations in the analytical biochemistry laboratory are concerned with determining biochemical constituents in the body fluids and tissues of normal and diseased farm animals. Special emphasis are given to constituents found in bovine fetal fluids (allantoic, amniotic, plasma)
when the cow has been exposed to infectious agents that cause abortion.

Key Publications


IMMUNOLOGICAL SECTION

Staff:
PA Rebers, PhD
M Phillips, PhD
S Stone, PhD
MT Jensen, MS
D Ashby, BS
RE Patterson, Technician

The chemistry of vaccine components capable of inducing protection against fowl cholera and the nature of the protective factors induced in the host by these vaccines are under study.

The usual vaccines produced with artificial media are capable of inducing homologous protection, but live vaccines, or formalized infected tissue vaccine, are capable of inducing cross protection as well. Direct inoculation of some laboratory media with livers from turkeys that died of fowl cholera have also produced cross protective killed vaccines. The cross protection is due, at least in part, to humoral factors since the immunity can be passively transferred.

Methods were developed and are in use to characterize lipopolysaccharides
from *Pasteurella multocida* by isopycnic methods in cesium chloride gradients. This procedure aids to identify the moiety from cell walls that may provide immunological specificity.

Studies are in progress to isolate, purify, and characterize toxins and toxic metabolites and specific antigens produced by *Brucella* organisms. These studies include determining the mechanism of toxin action at the cellular and molecular level in vitro and in vivo systems. A basic understanding of the pathogenicity and virulence of *Brucella* infection will contribute towards developing diagnostic and therapeutic techniques.

Methods are under study to isolate ribosomes from *Brucella* that may provide a degree of protection in cattle not attained with live vaccination as the immune response appears to be cell mediated with little or no indication of a humoral antibody.

Bovine leukemia research is directed toward characterizing viral and viral-related antigens. The major core protein (p24) of the bovine leukemia virus has been purified and radio-labeled with $^{125}$I and has been used in a radioimmunoassay to monitor antibody levels in infected and vaccinated cattle and sheep. Another viral related antigen, a glycoprotein GP-58, has been isolated from the culture fluids of cells infected with bovine leukemia virus, and further character-
ization of this glycoprotein is in progress. Studies are continuing with the virus and with other viruses; for example, transmissible gastroenteritis, to characterize subviral particles associated with these viruses for possible use as diagnostic aids and as immunogens to vaccines.

Key Publications


Current Publications


Phillips M, Rebers PA. Isopycnic characterization of lipopolysac-


PATHOLOGICAL RESEARCH LABORATORY

NF Cheville, DVM, PhD, ACVP--Chief
DL Finch--Secretary

The Pathological Research Laboratory conducts research on infectious diseases of domestic animals with emphasis on pathogenesis. Major efforts are currently placed on enteric diseases of cattle, respiratory diseases of sheep, septicemic infections of birds, equine hematologic disorders, and bovine lymphosarcoma. Techniques for which expertise and equipment are available include gross tissue examination, histology, autoradiography, microcinematography, fluorescent microscopy, and transmission and scanning

electron microscopy. Radiography, cell culture systems, biochemical techniques, and immunological methods are routinely used.

A weekly staff conference is conducted on histopathology in conjunction with the Armed Forces Institute of Pathology. Senior staff members may hold staff appointments in the College of Veterinary Medicine at Iowa State University and contribute to the teaching program of the graduate college. Courses in experimental pathology and enteric pathology are conducted by the pathology scientific staff and offered for credit at Iowa State University. Expertise for scientific collaboration is available from the staff at the University, its Veterinary Medical Research Institute, and the Veterinary Services Laboratory.

CALF SCOURS

Staff:
HW Moon, DVM, PhD, ACVP
R Isaacson, PhD
PL Runnels, DVM
RA Schneider, BS
K Brown, MS
P Sunday, BS
M Skartvedt, Technician
DJ Skortman, Technician

Two avenues and investigations are included in this project (1) mechanisms of intestinal colonization by enterotoxigenic Escherichia coli, and (2) developing diagnostic methods. The first focuses on bacterial pili (such as K99, K88, and 987-P antigens) that facilitate adhesion of E. coli to the microvilli of intestinal epithelial cells. In the electron micrograph at bottom, enteropathogenic E. coli are adherent to epithelial cell microvilli in the small intestine. The spike-like structures, which are the point of contact between bacterial and eukaryotic cells, are aggregated pili. Pilus morphology, chemistry, antigenicity, genetics, and eukaryotic host species specificity are under investigation. Antigenic characteristics are exploited in preparing experimental vaccines to protect against challenge with live, fully virulent bacteria and in developing diagnostic reagents to identify enteropathogenic E. coli. Nonadhesive colonizing attributes of enteropathogenic E. coli, such as those that affect growth rate and survival in the intestine, are also of interest.

Diagnostic methods are currently based on investigating spontaneous cases of calf scours. The objectives are (1) to determine which of the numerous infectious agents currently known to have the ability to cause diarrheal disease in calves are present, and (2) to evaluate existing methods for detecting these agents. Many of the agents are marginal pathogens or opportunists and are widely spread in the population and carried by clinically normal animals. The greatest diagnostic challenge is to develop means to determine if the disease was caused by one or several of the agents in question. Specific agents of concerns are E. coli, Salmonella, Cryptosporidium, Rotavirus, Coronavirus, bovine viral diarrhea virus, adenovirus, and chlamydia.

Key Publications

Immunization


Nagy B, Moon HW, Isaacson RE. Colonization of porcine intestine by entero-


Current Publications


RESPIRATORY DISEASES OF SHEEP

Staff:
RC Cutlip, DVM, PhD, ACVP
TA Jackson, DVM, PhD, ACVP

HD Lehmkuhl, PhD
GA Laird, Technician
JE Lenius, Technician
MS Brown, Technician
Research is devoted to identifying and characterizing individual disease entities, determining their prevalence and etiology, and evaluating the pathogenetic mechanisms of disease. Current studies are concerned with establishing progressive pneumonia in experimental animals and with the factors that enhance or impede susceptibility and control of spontaneous disease. Progressive pneumonia of sheep (PPS) is a slow viral disease endemic in the Rocky Mountain region and is similar to maedi in Iceland, zwoegersiekte in Holland, and so forth. It is traditionally confused with pulmonary adenomatosis, a disease whose insidious onset and slow progression closely simulate those of PPS. PPS is a chronic ailment with insidious onset and slow relentless progression to death. Sheep are 2 years or older before signs of disease are seen, and fatalities result from 6 months to 1 year later. The cardinal feature is impairment of pulmonary function by massive numbers of lymphoid cells in the lungs.

The causal virus has been isolated in cell culture and an agar gel immunodiffusion test developed to detect precipitating antibody to the virus. Using this test, the incidence of ovine progressive pneumonia was from less than 1 percent to more than 60 percent of old sheep at slaughter in different states in the United States. Virus isolation and pathologic changes corroborated the findings.

In studies of lymphocyte kinetics in sheep, cannulation techniques have been developed for the efferent lymph vessels of the prescapular and popliteal lymph nodes, as well as the thoracic duct. Lymphocytes collected by these techniques are examined for general properties.

**Key Publications**


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**RESPIRATORY AND SEPTICEMIC DISEASES OF POULTRY**

**Staff:**
- NF Cheville, DVM, PhD, ACVP
- LH Arp, DVM
- DI Buck, Technician
- LR Elliott, Technician
- A Jensen, Technician
- T Bertram, Technician

Research centers on colisepticemia in turkeys. One of the major problems in the turkey industry, this disease is characterized by both respiratory and enteric infection. Bacteria are recovered from the tissues of dying birds and are responsible not only for death but for failure to thrive after recovery. Isolates of *Escherichia coli* are being serotyped and examined...
for pathogenicity in view of vaccine production. Pathogenesis studies are designed to elucidate the ways in which bacteria pass the intestinal barrier and how they are cleared from the cloacal bursa. The role of the phagocytic bursal pad is being analyzed in the persistence of pathogenic E. coli in the bursa.

An adenovirus associated with severe outbreaks of disease has been isolated. Research on the pathogenesis of this disease and its associated bacterial superinfection entail its experimental reproduction and sequential examination of infected tissues. It has been found that immunosuppression is required to uniformly induce disease with this virus and that the respiratory system is susceptible to infection. The virus is being grown in vitro, and the usefulness of the culture for vaccine production will be studied.

Current Publications
Cheville NF, Arp LH. Comparative pathologic findings of Escherichia coli infection in birds. JAVMA 173:584-587. 1978.


HEMATOLOGIC DISEASES OF HORSES AND CATTLE
Staff:
D Barnett DVM, ACVP
DI Buck, Technician
JK Carter, BS
JD Dunshee, Technician

Major emphasis has been on the pathogenesis of bovine sarcosporidiosis and the mechanisms of acute muscle injury and abortion. Merogenous phases of Sarcocystis cruzi were demonstrated by light, immunofluorescent, and electron microscopy in the viscera and placenta of experimentally infected cows. Fluorescent antibody staining of sections of placental caruncles was developed as a practical diagnostic test for sarcocystis-induced abortion. The pathogenesis of equine viral arteritis is being studied with emphasis on platelet kinetics, coagulation factors, and the fibrinolytic system. Current research involves viral isolation from and fluorescent antibody staining of fetal tissues to elucidate the role of equine viral arteritis in abortion.

Current Publications
BOVINE LYMPHOSARCOMA

Staff:
MJ VanDerMaaten, DVM, PhD
RM Vegors, Technician
SL Hay, BS
JM Miller, DVM, PhD, ACVP
MJ Schmerr, PhD
KR Goodwin, Technician
M Phillips, PhD

The bovine lymphosarcoma research project is a multidisciplinary effort including staff members from the Virological, Pathology, and Biochemistry-Biophysics Research Laboratories. Research investigations are broad in scope but oriented toward solving practical problems encountered by livestock producers rather than investigating the basic biology of malignant neoplasms. Studies to date have contributed significantly to the etiologic significance of bovine leukemia virus and have resulted in the development of practical diagnostic tests to identify infected animals. Current research efforts include (1) studying potential avenues that transmit bovine leukemia virus and evaluating various husbandry methods, which may be used to prevent such transmissions; (2) developing and testing inactivated bovine leukemia virus vaccine preparations for use in controlling the spread of infection within cattle herds; and (3) separating and purifying bovine leukemia virus components for use in radioimmunoassay procedures and applying such assays in research studies.

Current Publications


Miller JM, VanDerMaaten MJ. Attempts to control spread of bovine leukemia virus infection in cattle by serologic surveillance with the glycoprotein agar gel immunodiffusion test. The Serological Diagnosis of Enzootic Bovine Leukosis, AA Ressang, ed. Commission of the European Communities, pp 127-133. 1978.


VanDerMaaten MJ, Miller JM. Sus-

VIROLOGICAL RESEARCH LABORATORY

ML Mengeling, DVM, PhD, ACVM--Chief
DC Wilken--Secretary

Research is conducted on economically significant diseases of livestock and poultry caused by viral or chlamydial agents. Studies involve various immunological, biochemical, and biophysical techniques; cell culture systems; and animal inoculations. Defined populations of experimental animals and excellent isolation facilities are available. Basic studies are conducted on virus-cell interactions and host responses using ultracentrifugation; ultrafiltration; fluorescent and electron microscopy; and radiochemical techniques.

Members of the Virological Research Laboratory staff may hold appointments in the Graduate College and College of Veterinary Medicine at Iowa State University. In this capacity, they advise graduate students and occasionally lecture to graduate and undergraduate classes. Visiting scientists from other laboratories in this country and abroad may, by special arrangement, join the Laboratory staff to conduct specific investigations and experiments of mutual interest and the contribution to the research goals of the National Animal Disease Center.

ENTERIC DISEASES OF CATTLE

Staff:
AW McClurkin, DVM, PhD

MF Coria, PhD
RG Marshall, BS
RL Smith, Technician
SL Stark, Technician

M. F. Coria, A. W. McClurkin (left to right)
R. G. Marshall
This project studies viruses associated with intestinal diseases of cattle and calves, viruses associated with neonatal diseases of calves including "weak-calf syndrome," and viruses that may cause intrauterine infections of the fetus resulting in fetal death and abortion or abnormalities in the newborn calf.

Bovine viral diarrhea virus (BVD), isolated aborted fetuses, neonatal calf diseases, and an acute disease of cattle manifested by elevated temperature; diarrhea; nasal discharges; and erosion of the rumen lining, abomasum, and intestine are studied to improve diagnostic procedures needed to isolate the virus and define the diseases that are associated with the virus. A killed virus BVD vaccine was developed and used in both experimental cattle and field cattle to study the influence of the killed vaccine on preventing diseases of the cattle population associated with BVD.

Research on bovine adenoviruses, isolated from "weak-calf syndrome" and other disease conditions of cattle, is studied to improve diagnostic methods and to determine the incidence of these viruses in the cattle population. Defining the nature of the experimental disease caused by the viruses is undertaken to assist veterinarians in recognizing diseases associated with bovine adenoviruses.

Research on bovine parvoviruses is carried out to develop diagnostic methods that will enable diagnosticians to determine the incidence of the virus in different disease conditions. The experimental disease is also studied both in pregnant cattle and calves to determine the nature of the disease conditions caused by bovine parvovirus and to help define disease conditions that could be recognized under field conditions as possibly caused by the virus.

Current Publications


Currently, reproductive disorders caused by porcine parvovirus and swine influenza virus are under investigation. Individual experiments are designed to evaluate the effect of selected viruses on the developing fetus, the stages of gestation when the embryo or fetus is most vulnerable to infection and injury, the pathogenesis of infection in the fetus, the response of the fetus to the infectious agent, the economic importance of the reproductive problems caused by the viruses, and the ways to prevent such reproductive failure.

Mycoplasma pneumonia is a chronic disease having a significant health-economic impact to the swine industry. In field outbreaks, the disease, initiated by the etiological agent Mycoplasma hyopneumoniae, is complicated by secondary microbial-lungworm-environmental factors. Attempts to prevent the disease have been based on eliminating M. hyopneumoniae from swine herds. Recently, interest was expressed in the immunoprophylaxis of this disease. The reason for this, primarily, was the knowledge that a stable immunity occurs in swine after experimental infection. Currently, basic and applied research are concerned with reducing M. hyopneumoniae infections in swine. Specific experiments include (1) infecting gnotobiotic and naturally farrowed pigs with M. hyopneumoniae and collecting respiration...
tory lavage for detecting the organism by cultivation procedures, and (2) elucidating the immune response of the pig to this organism and determining a means of stimulating this response without infecting the animal, for example, by vaccination.

Current Publications


VIRAL ENTERIC DISEASES OF SWINE

Staff:
LJ Kemeny, DVM
RD Woods, PhD
VL Wiltsey, Technician
LC Escher, Technician

Basic and applied research are conducted on methods to prevent and control swine enteric viral diseases. Research concerns the identification and the physiocochemical characteristics of the etiological agents and their antigens. The cellular and humoral immune responses in swine exposed to these viruses are investigated to define their role in preventing a reinfection or facilitating recovery from an infection. Developing an in vivo or in vitro diagnostic test to detect carrier swine and identifying the conditions that result in the shedding of infectious virus.
from these carrier swine is of major importance. The final goal of the research is to control the disease by eradicating or selecting an attenuated virus strain that could be used to vaccinate pregnant sows and gilts so they would provide the immunity for their suckling pigs against a virulent virus challenge.

**Current Publications**


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**ORNITHOSIS IN POULTRY**

**Staff:**
LA Page, PhD
WA Boney, Jr, DVM, MS
J Tessler, MS
JA Wells, Technician
MD McFarland, Technician
VP Meador, Technician

Ornithosis (avian chlamydiosis) is an infectious, debilitating, sometimes fatal disease of birds caused by the bacterium Chlamydia psittaci. Chlamydiae are widely distributed among wild and domestic animals, especially birds, and cause pneumonic, septicemic, enteric, arthritic, and reproductive diseases of birds and mammals, including man.

Virulent chlamydial strains of undetermined origin cause sporadic, localized outbreaks in domestic turkeys. Economic losses result from bird mortality, weight losses, reproductive failure among breeders, expense of antibiotic treatment, and condemnations of birds at processing plants. Furthermore, epidemics of pneumonic chlamydiosis (psittacosis) among processing plant employees occur wherever infected birds were sent for processing.

![J. Tessler, W. A. Boney, Jr. (left to right)](image-url)
Research approaches used at NADC to improve methods for control of ornithosis are to (1) develop effective vaccines to protect birds raised in high risk areas and identify mechanisms of immunity; (2) improve diagnostic procedures by developing rapid serologic and immunofluorescent tests for the disease; (3) update regimens for antibiotic therapy of the disease to prevent development of latent infections and antibiotic resistance; and (4) identify ornithosis-carrying species among wildlife and determine mechanisms of transmission.

Current Publications


PSEUDORABIES

Staff:
DE Gutekunst, DVM, MS
EC Pirtle, PhD
HR Hill, Technician
SK Puderbaugh, Technician

Areas of research on pseudorabies virus (PRV) infections of swine involve (1) developing and evaluating diagnostic tests, (2) investigating the role of cellular and humoral immunity in the prevention of and recovery from PRV infection, (3) developing an effective inactivated vaccine to prevent clinical disease, (4) studying the ontogeny of immunoglobulins in infected swine, and (5) determining the factor involved with latency of the virus in infected swine.

Current Publications


Gutekunst DE and Pirtle EC. Micro-immunodiffusion test for assaying


RESPIRATORY DISEASES OF CATTLE

Staff:
KG Gillette, DVM, PhD
GH Frank, DVM, PhD, Dipl. ACVM
JK Peterson, Technician

Current research on bovine respiratory disease is concerned with studying etiology, pathogenesis, and mechanisms of resistance to infection in the shipping fever complex and enzootic pneumonia of calves. Investigations on acute respiratory disease in transported (feeder) cattle implicate a multiplicity of causative agents including PI-3, IBR, BVD, RS viruses and Pasteurella hemolytica organisms. A detailed study of P. hemolytica involved in respiratory tract disease resulted in developing a specific, rapid plate agglutination procedure for serotyping the organism. Some specific objectives of current research in bovine respiratory disease are (1) identifying specific infectious agents associated with the shipping fever complex; (2) studying mechanisms of infection and resistance in experimental infection with P.
hemolytica and with respiratory syncytial virus, and (3) developing reference reagents to study etiologic agents involved in the respiratory disease complex. A cooperative study on the relationship of environmental and transportation stress to immunity and resistance of feeder cattle to pathogens of bovine respiratory disease should provide new epidemiological information on multiple infections and serologic data on specific viral and bacterial agents.

Current Publications

Frank GH, Marshall RG and Smith PC. Clinical and immunological responses of cattle to infectious bovine rhinotracheitis virus after infection by viral aerosol or intramuscular inoculation. AJVR 38:1497-1502. 1977.


PHYSIOPATHOLOGY RESEARCH LABORATORY

Shannon C. Whipp, DVM, PhD--Chief
Annette Bates--Secretary

Research is directed toward defining pathogenic mechanisms of infectious and noninfectious diseases of domestic animals. Research areas include (1) physiopathology of calcium, phosphorous, magnesium, and vitamin D metabolism (milk fever, grass tetany, rickets, oxalate toxicity); and (2) gastrointestinal physiopathology (intestinal transport processes, mechanisms of diarrheal disease, functional characteristics of intestinal microflora). Research areas include excellent surgical facilities, recording equipment, and variety of automated analytical technology. The following areas of expertise are available (1) anaerobic microbiology; (2) peptide hormone purification, bioassay, and radioimmunoassay; (3) quantitation of vitamin D metabolites; (4) experimental surgery; (5) endocrinology; (6) in vitro and in vivo gastrointestinal physiology; (7) gnotobiology; and (8) radiotelemetry.
Excellent opportunities exist for collaborative research in all areas of animal disease with other sections of this laboratory and with Iowa State University.

GASTROENTERIC PHYSIOLOGY

Staff:
SC Whipp, DVM, PhD
RA Argenzio, PhD
RW Morgan, Technician
DF Lebo, Technician
BW Mullen, RN

Emphasis in this area is placed on the study of normal gastrointestinal transport mechanisms and on diarrheagenic mechanisms in diarrheal diseases of domestic animals.

One of the current studies examines the range and magnitude of absorption and the physiological and pharmacological factors influencing absorption. These studies provide a framework for interpreting diarrheal mechanisms and their control. The pig is the primary experimental animal, but other species are used when a particular mechanism is exemplified.

A second project is concerned with elucidating the transport mechanism...
and active secretory system responsible for the small bowel diarrhea elicited by enteropathogenic E. coli. Two porcine strains of heat-stable enterotoxin have recently been purified and are currently being used in the studies.

Isolated loops of proximal jejunum are inoculated with enterotoxin, and the net changes in luminal contents are assessed. In addition, an in vitro method & Ussing Chamber) is employed in which electrochemical gradients and other passive driving forces can be controlled.

Three areas of investigation have been conducted in examining the pathogenesis of swine dysentery. These are (1) changes in ion transport from isolated colonic loops, histopathological changes, and changes in blood chemistry in pigs infected with Treponema hyodysenteriae; (2) permeability changes in colonic mucosa of infected pigs; and (3) isotopic tracer studies of Na and Cl unidirectional fluxes from isolated colonic loops.

Key Publications


CURRENT PUBLICATIONS


MINERAL METABOLISM STUDIES

Staff:

ET Littedike, DVM, PhD
RL Horst, PhD
CA Hauber, Technician
AC Wheeler, Technician

Our mineral metabolism project includes studying the basic metabolism of calcium, phosphorous, and magnesium, as well as diseases of mineral metabolism in several animal species. These studies include measuring the parathyroid hormone, calcitonin, and vitamin D and most of its known metabolites. Studying the basic regulatory interrelationships between
these minerals and their regulatory hormones and vitamins provides a basis for evaluating defects that occur as a series of disease complexes in domestic animals.

A series of studies have been conducted on milk fever in dairy cattle with the ultimate objective of developing management techniques to effectively prevent this disease. These studies, which include defining the physiopathology of this disease, indicate that the basic problem is an inability to respond appropriately to the calcium demand that occurs when coincident with initiation of lactation begins. Several effective prepartum regimens have been devised to facilitate calcium mobilizing that include low calcium diets, prepartum milking, and administering vitamin D or certain of its metabolites.

Studies have also been conducted on the physiopathology of grass tetany and the metabolism of Ca and Mg in this condition. The primary mineral imbalances include hypomagnesemia, hypocalcemia, and low cerebrospinal fluid magnesium concentrations. It also appears that there is a defect in secretion of parathyroid hormone, which is secondary to severe hypomagnesemia. A defect in target tissue response to parathyroid hormone is also postulated. Thus, prolonged hypomagnesemia and hypocalcemia are present. Current studies include defining the changes in concentrations of vitamin D and its metabolites, which occur in this condition.

A substantial effort is being made to characterize disease syndromes involving deficiencies or toxicities of vitamin D, which occur in domestic animals. Basic deficiency studies are being done in the pig. Neonatal pigs have low levels of the precursors for biologically active metabolites of vitamin D. These low levels are maintained until weaning time in pigs raised in confinement and fed standard commercial diets.

Thus, these studies have major implications regarding current husbandry practices. The pig appears to be an excellent model for studying the development of D deficiency in several species. The sequence of changes in blood and bone that occur as young pigs develop rickets have been characterized. The physiopathology of spontaneous D deficiency occurring in young pigs and turkeys is currently being characterized. Studies of pathogenesis of vitamin D toxicity in cows are in progress in which the vitamin D metabolites responsible for the toxicity are being quantitated.

The pathogenesis of halogetan toxicity in sheep has been described.

Key Publications


Current Publications


Haussler M, Hughes M, Baylink D, Littledike ET, Cork D, Pitt M. Influence of phosphate depletion in the

GASTROINTESTINAL MICROBIOLOGY

Staff:
MJ Allison, PhD
IM Robinson, MS
K Sawson, Ms
HM Cook, Technician
JA Bucklin, Technician

One area of investigation concerns the interactions between gastrointestinal microbes and toxic substances. Most of our effort to date has been directed toward obtaining an understanding of such activities in the rumen. For example, we found that ruminal microbial populations able to degrade oxalic acid at greatly increased rates are selected when plants containing high amounts of oxalic acid are included in the diet of either cattle or sheep. Degradation involves interactions between several microbes. The nature of these interactions, the factors involved in selecting competent species, and identifying the active agents are being investigated. Other interactions that have been studied include degradation of botulinum toxin and of aflatoxin B1, and work is planned with nitrate-nitrite metabolism.

A second goal of the project is to describe the gastrointestinal population of the cecum and colon of swine in both taxonomic and physiologic terms. The predominant bacteria are fastidious anaerobes but, at present, information concerning them is limited. Work is in progress to classify a large number of isolates from both normal pigs and pigs with swine dysentery. This work also involves culture and scanning electron microscopic studies of bacterial populations attached to cecal and colonic mucosa. Current studies also involve measuring rates of organic acid produced in the lower bowel of pigs fed either high or low fiber diets. These studies are designed to permit an estimate of the significance of this production to the energy metabolism of swine.

A third area of investigation is directed toward defining the etiology of swine dysentery. Current studies involve using gnotobiotic pigs to define the anaerobic flora that participate synergistically with Treponema hyodysenteriae in the pathogenesis of this disease.
Aerobes, which have been found to be present in high numbers in colonic epithelium of conventional pigs with clinical swine dysentery, are being evaluated individually and in various combinations for the ability to induce colonic lesions in germ-free pigs when T. hyodysenteriae is present. The ultimate goal of this project is to define the mechanism through which these organisms cause damage to colonic epithelium and epithelium function.

Rumen anaerobic mycoplasma are also being studied. The characteristics of these organisms, their nutritional requirements, and their ecological role in rumen microflora are being defined.

**Current Publications**


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**DEVELOPMENT OF RADIO TELEMETRY SYSTEM FOR TRANSMITTING PHYSIOLOGIC DATA**

**Staff:**

JL Riley, MS

Radio telemetry systems are being developed and used at NADC to record physiologic data from normal and diseased animals without restraint. Transmitters monitor temperature, EKG, respiration rate, blood pressure, rumen motility, and EEG. Present emphasis is on developing data acquisition systems to reduce data by computer analysis. In the future, longer-range, longer-life transmitters are to be developed so data may be recorded from animals at greater distances from the receiver.
Key Publications


Current Publications


BIOLOGICAL SAFETY UNIT

JF Sullivan--Safety Officer
KA Burke--Secretary

In the biological safety unit of NADC we are concerned with identifying, assessing, and controlling hazards associated with research and regulatory activities carried on within the Center. Safety research programs are designed to protect Center employees from zoonotic disease agents under investigation and to prevent the unplanned contamination or infection of laboratory media or animals used in experiments, diagnostic or biologics assay programs. Major research areas include evaluating disinfectants and disinfecting procedures; developing sterilization criteria for biological materials and other contaminated materials with heat or ethylene oxide; constructing and evaluating cages; exposing chambers and other containment systems, as well as the design and fabrication of safety pipettors, formaldehyde generators, and other safety equipment items. Independent and cooperative studies involving the behavior infectivity and pathogenicity of biological or toxic aerosols are also investigated or supported by this unit.

Senior staff members serve as technical advisors to other SEA and USDA agencies with respect to the design and operation of biological safety laboratories and the control of hazards attending work with biological systems. They also serve as consultants to numerous federal, state, and private agencies in matters pertaining to biological and laboratory safety.
BIOLOGICAL LABORATORY SAFETY RESEARCH

Staff:
JL Sullivan, DVM, MS
JR Songer, MS
DL Braymen, MS
RG Mathis, BS
TP Nelson, Technician

Aerosol Studies

In this study, we investigated the effects of ionized air on mechanically generated aerosols in pens equipped with a corona discharge negative-air ionizer and a 6,000 volt positively charged wall panel. Tests conducted under these conditions reduced aerosol by 90 percent. In static chamber studies employing viable fungal spores, 90 percent count reductions \(1\times10^4\) to \(1\times10^4.8\) were achieved at the end of 4-minute exposure to ionized air.

Containment Equipment Systems

A Class I containment cabinet system was fabricated for work with avian tuberculosis. This system was designed to contain hazardous aerosols generated in the commercial operations relating to the initial handling, grinding, casing and smoking of hot dogs.

A Class III, or gas tight containment cabinet and aerosol exposure system, was developed for work with moderate to high hazard agents and toxins. This system is currently being used in studies involving exposure of laboratory animals to carcinogenic aflatoxins.

Current Publications


