

Curriculum Vitae

Nancy E. Coe Clough

Education

Doctor of Philosophy, Iowa State University, 1992

- Major: Veterinary Microbiology, Minor: Veterinary Pathology
- Dissertation: Pathogenesis of *Salmonella typhimurium* in swine and interactions with porcine neutrophils

Doctor of Veterinary Medicine, Iowa State University, 1986

- Graduated with distinction

Board Certification

Diplomate, American College of Veterinary Microbiologists, 1992

- Certification in immunology and virology subspecialties

Work Experience

Consultant, Edge Veterinary Vaccines Consulting Group, 2020-present.

- Advise established and start-up companies how to deal with the USDA's regulatory structure for licensing veterinary biologics

Senior Staff Veterinarian, Policy, Licensing, and Evaluation Unit, Center for Veterinary Biologics, USDA-APHIS, 2001-2007, 2010-2018

- Scientific review of regulatory submissions for companies seeking licensure of veterinary vaccines, diagnostic kits
- Write and edit regulatory policy regarding veterinary biologics
- Lead program representative for multiple process improvement initiatives, including conversion to electronic submissions, document retrieval, and reporting. Resulted in USDA Honor Award for Excellence, 2014, and USDA Secretary's Award for Customer Service, 2015.
- Mentor for new reviewers

Chief of Staff, National Veterinary Services Laboratories, USDA-APHIS, 2007-2010

- Assistant to Director regarding process improvement initiatives
- NVSL Webmaster

Veterinary Medical Officer, Laboratory Unit, Center for Veterinary Biologics, USDA-APHIS, 1991-2001

- Develop standardized *in vitro* test methods and reagents for measuring potency of vaccines
- Provide technical support to biologics manufacturers, government licensing authorities, and biologics inspectors
- Develop and maintain quality assurance procedures and documentation necessary for ISO certification

Veterinary Medical Officer, National Animal Disease Center, USDA-ARS, 1988-1991

- Research on pseudorabies virus (mapping of neutralizing epitopes of proteins gIII and gp50)
- Research on pathogenesis of *Salmonella typhimurium* in swine (characterization of the carrier state; effect of specific bacterial mutations on colonization, virulence, and immune response)

Review/Editing

- Ad hoc reviewer, USDA Competitive Grants Program
- Peer review editor, *Biologicals* journal, ca. 2004-2022

Selected Publications

Erdman, MM, Clough, NE, Hauer, PJ. 2020. Review of updated regulations and product license categories for veterinary vaccines in the United States. *J. Am. Vet. Med. Assoc.* 257: 1142-1147.

Clough, NEC, and Hauer, PJ, 2005. Using polyclonal and monoclonal antibodies in regulatory testing of biological products, *ILAR J*, 46:300-306.

Clough, NEC, 2004. Chapter 18: Diagnostico Inmunocelular. In Pennimpede, EF, Gomez, CM, and Stanchi, NO (eds), *Introduccion a la inmunobiologia*. Universidad de La Plata, Argentina, pp. 471-491.

Hauer PJ, Clough NE, 1999. Development of monoclonal antibodies suitable for use in antigen quantification potency tests for clostridial veterinary vaccines. *Dev. Biol. Stand.*, 101:85-94.

Kolbe, D, and Clough, NEC, 1999. Quantitation of commercial equine tetanus antitoxin by competitive enzyme linked immunosorbent assay. *FEMS Immunol. Med. Microbiol.*, 24(3):313 317.

Clough, NEC, and Roth, JA., 1998. *Mosby's Biomedical Science Series: Understanding Immunology*. St. Louis: Mosby Yearbook, Inc., 225 pp.

Clough, NEC, Hauer, PJ, and Whitaker, MS, Henderson, LM, 1998. Use of a sandwich ELISA for antigen quantitation of erysipelas bacterins. *Pharmeuropa*, Bio 98 1:60 64.

Clough, NEC, and Roth, JA, 1995. Methods for assessing cell mediated immunity in infectious disease resistance and in the development of vaccines. *J. Am. Vet. Med. Assoc.*, 206:1208 1216.

Coe, NE, Frank, DE, and Roth, JA, 1993. The effect of recombinant human cytokines on porcine neutrophil function. *Vet. Immunol. Immunopathol.*, 37:39 47.

Coe, NE, and Wood, RL, 1992. The effect of exposure to a Δ cya Δ crp mutant of *Salmonella typhimurium* on the subsequent colonization of swine by the wild type parent strain. *Vet. Microbiol.*, 31:207 220.

Coe, NE, Frank, DE, Wood, RL, and Roth, JA, 1992. Alteration of neutrophil function in BCG treated and nontreated swine after exposure to *Salmonella typhimurium*. *Vet. Immunol. Immunopathol.*, 33:37 50.

Coe, NE, and Mengeling, WL, 1990. Mapping and characterization of neutralizing epitopes of glycoproteins gIII and gp50 of the Indiana Funkhauser strain of pseudorabies virus. *Arch. Virol.*, 110:137 142.