International Workshop on Alternative Methods to Reduce, Refine, and Replace the Use of Animals in Vaccine Potency and Safety Testing: State of the Science and Future Directions

William H. Natcher Conference Center, Bethesda, MD, USA
September 14-16, 2010

Suggested Reading

Session 1 Overview of Public Health Needs and Regulatory Requirements for Vaccine Testing

History and Overview of Human Vaccines and their Importance to Public Health

André FE. 2003. Vaccinology: past achievements, present roadblocks and future promises. Vaccine. 21:593-595.

Waldmann TA. 2003. Immunotherapy: past, present and future. Nature Medicine. 9:269-277.

History and Overview of Veterinary Vaccines and their Importance to Animal Health

Meeusen ENT, Walker J, Peters A, Pastoret P, Jungersen G. 2007. Current status of veterinary vaccines. Clinical Microbiology Reviews. 20:489-510.

U.S. FDA Requirements for Human Vaccine Safety and Potency Testing

21 CFR Parts 600 through 680

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Guidance for Industry for the Evaluation of Combination Vaccines for Preventable Diseases: Production, Testing and Clinical Studies available at: http://www.fda.gov/downloads/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Guidances/Vaccines/UCM175909.pdf

Taffs RE. 2001. Potency tests of combination vaccines. Clin. Infect. Dis. 33(Suppl 4):S362-366.

USDA Requirements for Veterinary Vaccine Safety and Potency Testing

21 CFR Parts 600 through 680

International Regulatory Requirements for Vaccine Safety and Potency Testing: Roundtable Discussion

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He Z. 2007. Alternative methods for animal tests in the quality control of biological products in China. AATEX 14:Special Issue, 591-593.

Kawanishi T. 2006. Regulatory perspectives from Japan – comparability of biopharmaceuticals. Biologics. 34:65-68.

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Session 2 Replacement Methods for Vaccine Potency Testing: Current State of the Science and Knowledge Gaps

Overview of Currently Approved Veterinary Vaccine Potency Testing Methods and Methods in Development That Do Not Require Animal Use

Rosskopf-Streicher U, Johannes S, Wilhelm M, Cussler K. 2001. Quality control of inactivated erysipelas vaccines: results of an international collaborative study to establish a new regulatory test. Vaccine. 19:1477-1483.

Hendriksen CFM. 2002. Refinement, reduction, and replacement of animal use for regulatory testing: current best scientific practices for the evaluation of safety and potency of biologicals. ILAR Journal. 43: Supplement S43-S48.

Maas RA, de Winter MPM, Venema S, Oei HL, Claassen IJTM. 2000. Antigen quantification as *in vitro* alternative for potency testing of inactivation viral poultry vaccines. Vet. Quart. 22:223-227.

Case Study of Development, Validation, and Acceptance of a Non-Animal Method for Assessing Veterinary Vaccine Potency

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Claassen I, Maas R, Oei H, Daas A, Milne C. 2004. Validation study to evaluate the reproducibility of a candidate *in vitro* potency assay of Newcastle disease vaccines and to establish the suitability of a candidate biological reference preparation. Pharmeuropa Bio. 2004:1:1-15.

Liljebjelke KA, King DJ, Kapczynski DR. 2008. Determination of minimum hemagglutinin units in an inactivated Newcastle disease virus vaccine for clinical protection of chickens from exotic Newcastle disease virus challenge. Avian Diseases. 52:260-268.

Overview of Currently Approved Human Vaccine Potency Testing Methods That Do Not Require Animal

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Overview of The Current Status of Human Vaccine Potency Testing Methods in Development That May Replace Animals

Coombes L, Stickings P, Tierney R, Rigsby P, Sesardic D. 2009. Development and use of a novel *in vitro* assay for testing of diphtheria toxoid in combination vaccines. J. Immuno. Methods. 350:142-149.

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Session 3 Animal Use for Vaccine Potency Testing: Refinement and Reduction Alternatives

Session 3A: Refinement Alternatives: Using Serological Methods to Avoid Challenge Testing

Refinement Alternatives for Human Vaccine Potency Testing: Overview of Currently Approved Serological Methods

Refinement Alternatives for Veterinary Vaccine Potency Testing: Overview of Currently Approved Serological Methods

Animal Refinement and Reduction Alternative Approaches for Vaccine Potency Testing of Diphtheria and Tetanus Vaccines

Kumar S, Kanwar S, Bansal V, Sehgal R. 2009. Standardization and validation of Vero cell assay for potency estimation of diphtheria antitoxin serum. Biologicals. 37:297-305.

Development and Validation of Serological Methods for Human Vaccine Potency Testing: Case Study of an Anthrax Vaccine

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Development and Validation of Serological Methods for Veterinary Vaccine Potency Testing: Case Study of a Veterinary Vaccine

Hendriksen C, Woltjes J, Akkermans AM, van der Gun JW, Marsman FR, Verschure MH, Veldman K. 1994. Interlaboratory validation of the in vitro serological assay systems to assess the potency of tetanus toxoid in vaccines for veterinary use. Biologicals. 22:257-268.

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Session 3B: Refinement Alternatives: Using Earlier Humane Endpoints to Avoid or Minimize Animal Pain and Distress in Vaccine Potency Challenge Testing

Overview of Current Humane Endpoints in Human and Veterinary Vaccine Potency Testing

Castle P. The European pharmacopoeia and humane endpoints. http://www.lal.org.uk/pdffiles/CASTLE.PDF.

Hendriksen CFM, Steen B, Visser J, Cussler K, Morton D, Streijger F. 1999. The evaluation of humane endpoints in pertussis vaccine potency testing. In: Hendriksen CFM, Morton DB, eds. Humane endpoints in animal experiments for biomedical research. London: The Royal Society Medicine Press, p. 106–13.

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Overview of Current Reduction Methods and Reduction Methods in Development for Vaccine Potency Testing

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Session 3B General References

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Session 4 Vaccine Safety Testing: Post-Licensing Reduction, Refinement and Replacement Methods and Strategies

Human Vaccine Post-license Safety Testing: Overview of Current Regulatory Requirements and Accepted Alternatives

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