# Multi-drug resistant *Salmonella* Dublin cultured from cryopreserved Holstein semen

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## Introduction

*Salmonella enterica* subspecies *enterica* serotype Dublin, commonly referred to as *Salmonella* Dublin, has emerged as one of the most isolated serotypes of Salmonella in U.S. cattle. A highly multi-drug resistant isolate of *Salmonella* Dublin was cultured at the Wisconsin Veterinary Diagnostic Laboratory (WVDL) from both the raw and cryopreserved, extended semen of a 17-month-old clinically healthy Holstein bull. The objective of this study was to use antemortem and postmortem diagnostic testing to evaluate the systemic health of the bull and determine where he was harboring the *Salmonella* Dublin infection.

## Materials and methods

The bull from which the *Salmonella* Dublin was isolated, was transported from the herd of origin to the University of Wisconsin Veterinary Teaching Hospital's isolation facility for antemortem diagnostic testing and euthanasia. A complete physical examination was performed. Blood was also collected using aseptic technique for culture, complete blood count, and biochemistry profile. A full postmortem examination was performed including histopathology of numerous tissues. Postmortem diagnostics included culture, antimicrobial susceptibility testing, and molecular PCR of numerous tissues and fluids. Retrospective serum evaluation was also performed on banked serum.

## Results

Upon arrival to the Veterinary Teaching Hospital, the bull was bright, alert, and well-conditioned. Vital parameters (rectal temperature, heart rate, respiratory rate and rumen contractions) were within respective reference ranges and no other abnormalities were present on physical examination. Blood culture yielded no growth. The complete blood count showed a mild segmented neutrophilia (6,500/uL; reference 1,600-6,100) and hyperfibrinogenemia (700 mg/dL; reference 200-600). Chemistry showed mild hypernatremia (142 mmol/L; 133-141), hypokalemia (3.0 mmol/L; 4.0-5.3), elevated total CO2 (37 mmol/L; reference 25-34), hypomagnesemia (1.8 mg/dL; reference 2.0-3.0), hyperglycemia (107 mg/dL; reference 39-78), hyperalbuminemia (3.5 g/dL; 2.3-3.2), and low cholesterol (75 mg/dL; reference 95-396). None of these electrolyte abnormalities were considered clinically significant. Similarly, gross postmortem examination did not reveal any significant lesions. The testicles, accessory sex glands, prostate, penis, and prepuce were grossly within normal limits. On histopathology, the only lesion of note was mild centrilobular hepatocellular degeneration. *Salmonella* Dublin was cultured from samples of the urine, bile, and feces as well as the prostate, seminal vesicles, preputial mucosa, colon, and small intestine. Susceptibility testing demonstrated resistance to the 4 antimicrobials (gentamicin, tylosin, lincomycin, and spectinomycin) used to extend bovine semen. Upon discovery of this highly multi-drug resistant isolate, the WVDL analyzed archived serum from the 17-month-old Holstein bull and discovered the bull had 5 consecutive monthly positive *Salmonella* Dublin ELISA tests with percent positivity ranging between 135-157 (positive >35%).

## Significance

This report outlines a case of a clinically healthy, mature Holstein bull found to be shedding highly multi-drug resistant *Salmonella* Dublin in his semen and feces. Post-mortem examination determined that the bull was harboring the organism in the lumen of his gastrointestinal tract as well as accessory sex glands. To the authors' knowledge, this is the first report of *Salmonella* Dublin being isolated from cryopreserved bovine semen in the United States.

  