

## APPLICATION OF SYSTEMS THINKING DISCIPLINE IN BEEF CATTLE VETERINARY MEDICINE

W24

### Application of System Thinking Discipline in Cattle Veterinary Medicine

Dale Grotelueschen<sup>1</sup>, John Groves<sup>2</sup>, Brian Vander Ley<sup>3</sup>, William Prokop<sup>4</sup>.

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**Objectives:** Many veterinary practitioners and consultants play critical and indispensable roles in the management and decision-making processes of large, complex production structures. The discipline of systems thinking offers opportunity and methodology to understand the interrelated forces that impact complex systems over time in ways that help to identify innovative and high-leverage solutions. It is the objective of this workshop to provide an introduction to the key concepts and principal methodologies of systems thinking by sharing examples of its application in an array of professional activities associated with cattle veterinary medicine.

**Materials and methods:** The historical context of systems thinking and its suitability for application in cattle veterinary medicine will be presented. The faculty will present applications in professional activities related to beef practice/consultation, dairy practice/consultation, and academia.

Key Concepts to be highlighted in the examples include:

- The Iceberg Framework is a tool used in systems thinking that helps accurately define and deeply understand the problem being investigated.
- Mental Models are instinctive theories we have about how the world works. They are driven primarily by our past experiences and how we have learned to solve problems before. The Systems Thinking discipline provides the framework to break out of the models that hinder your ability to innovate.
- Causal loop diagrams consist of balancing loops, reinforcing loops, vicious cycles, virtuous cycles, and system delays provide the “language” of Systems Thinking. The relationship between language and thought processes can’t be underestimated. Most western languages are linear in nature, which tends to drive linear thinking and linear problem solving. A fundamental principle of Systems Thinking is that parts of a system are related in non-linear ways and are interconnected in circular associations and feedback loops.
- Creative tension is a systems thinking principle and is contingent upon creating both personal and shared vision regarding the desired state or output of a complex adaptive system. Systems Thinking is also rooted in personal mastery that is based on a commitment to the truth about the reality of the current state or output of the system. The difference between the current state and the desired state produces disequilibrium that drives the creative tension in the system. Without

a vision, there is no real motivation to change. Without a clear understanding of where we are, we have no basis for effective action. To reach equilibrium, complex adaptive systems must resolve this tension.

- System homeostasis refers to the principle that the complex systems we work with have developed and evolved over a long time period and are very adept at maintaining their baseline function. Complex systems produce results they are designed to produce, but those results may not be what we were hoping for. Often when we try to change or modify how a system works, the system will “push back” and return to homeostasis. Systems tend to push back by producing unintended consequences to our interventions. Understanding these unintended consequences is a big part of becoming an effective systems thinker. High leverage interventions made to a system produce the largest desirable change while producing the fewest unintended consequences.

**Conclusions:** One of the main outcomes of this workshop is to help give insight into fundamental principles of systems, in order to more directly show that systems are capable of driving their own behavior. Even when all players in a system behave in rational and scientifically based ways, the system still exerts forces of which most of us are unaware. Deep understanding of these forces lies in understanding the nature and structure of interrelationships between variables in the system, not just a deep understanding of the variables. Another outcome is to open a dialogue regarding a long-term vision to be shared among system stakeholders. Within the discipline of systems thinking, creative tension can be generated as a tool to move toward change. In order to have creative tension or pressure to change, we need to establish a shared vision that is based on the current reality of where we are at today and a clear idea of what we wish to achieve.

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William Prokop, John Groves, Dale Grotelueschen, Brian Vander Ley.

*Dairy Innovations LCC /Arm and Hammer Inc, USA.*

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<sup>1</sup>University of Nebraska-Lincoln Great Plains Veterinary Educational Center, USA; <sup>2</sup>University of Nebraska-Lincoln, USA; <sup>3</sup>Livestock Veterinary Service; <sup>4</sup>Dairy Innovations, LLC, USA.

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**RELIES ON YOU.**

**YOUR BUSINESS**

**RELIES ON HIM.**

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**CAN PROTECT BOTH.**

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**DAIRY CATTLE**



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