



THE CONNECTION BETWEEN FOOD SAFETY, PUBLIC HEALTH, AND ANIMAL WELFARE

LAUREN DAVIS
APRIL 28, 2023

A close-up photograph of a dog's snout, showing a unique pattern of blue, white, and pinkish-red fur. The dog's eyes are closed, and its snout is resting on a dark surface. The text "Are they related?" is written in a yellow, cursive font across the bottom of the image, with a dashed line underneath it.

Are they related?

What do you think? —→

1. Food Safety
2. Animal Welfare
3. Public Health



FOOD SAFETY

PUBLIC HEALTH

ANIMAL WELFARE



Food Safety



PATHOGENS

- *Salmonella*
- *E. coli* (generic and STEC)
- *Campylobacter*



ZOONOSIS THROUGH PRIONS

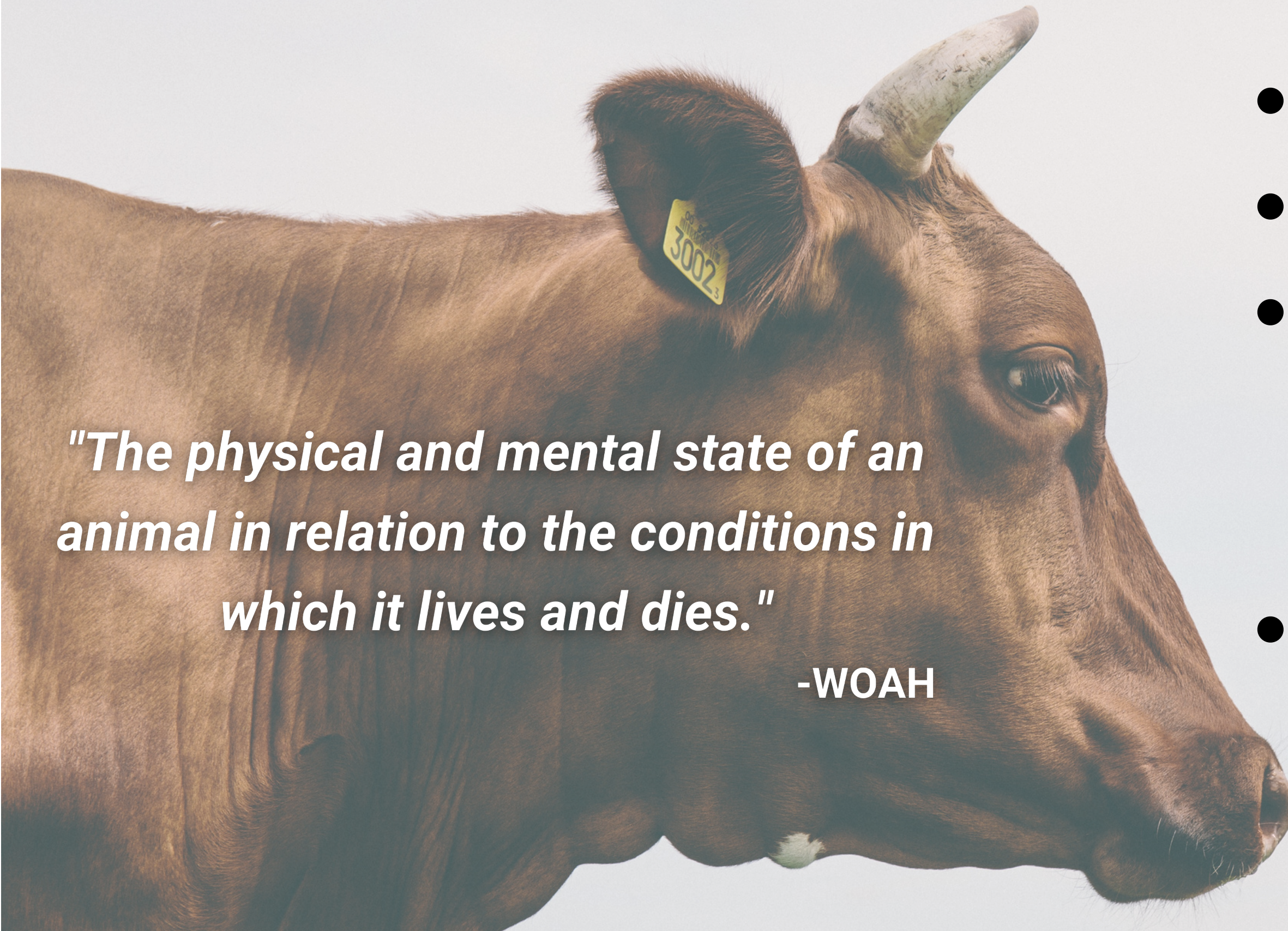
Bovine spongiform encephalopathy (BSE) aka "Mad Cow Disease" -> Creutzfeldt-Jakob disease (vCJD) in humans



RESIDUES

- Drug withdrawals
- Antibiotics and antibiotic resistance
- Hormones

Animal Welfare



"The physical and mental state of an animal in relation to the conditions in which it lives and dies."

-WOAH

- 5 Freedoms
- 5 Domains
- Human-animal relationship/interactions
- Indicators
 - Direct vs. Indirect

Biosecurity

- A critical factor in protecting animals and ensuring not only their health and welfare, but also PUBLIC health and welfare
- Intensively farmed systems better or worse than traditional?



True Story

- A large processing plant in the USA (2022) had a large outbreak of influenza A brought in by pigs. The USDA ran tests and found it.
- Approximately 400 people became ill.



Seventy-five percent of all emerging human infectious diseases originate from animals (Taylor et al. 2001).

Public Health



***"Science of protecting
and improving the health
of people and their
communities."***

(CDC Foundation 2023)

- Food Safety
- Biosecurity
- Zoonotic Diseases
- Human Illness

↓ Animal Illnesses
+ ↓ Bacterial contamination
↓ Stress

↑ Animal welfare
= ↑ Food Safety
↑ Public Health

Portfolio Products



PRODUCT A

iMOVES reflection article for the One Health Newsletter



PRODUCT B

Presentation for CSU Graduate Students - Animal Welfare and Food Safety



PRODUCT C

Blog Article – Animal Welfare and Food Safety: A One Health Approach



PRODUCT D

Standardized Bison Harvest Audit Tool



Product A: iMOVES Reflection Article

June 2022:
University of Padova
Padua, Italy

iMOVES: International Mobility of Veterinary Students

iMOVES Summer 2022 Course: Food Safety, Public Health and Animal Welfare in Terrestrial and Aquatic Animals

DEPARTMENTS OF BCA AND MAPS



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

“Shaping a World-class University - Seed funding for Digitalization & Innovation”
Blended version of the Summer School iMOVES= international Mobility Of Veterinary
Students

2022 Edition, 1st part, Online lectures

Title: Food safety, Public health & Animal Welfare in terrestrial and aquatic animals
In collaboration with: Universities from USA (Texas A&M, Kansas State, Colorado State, Penn State), Australia (Sydney) and South Africa (Kwazulu-Natal)

DATE/TIME	TOPIC	SPEAKER
Monday, 6th June	DAY 1	
4.30 pm (CET)	Ice breaking activity ¹	Prof. Marco Patrino (BCA, UniPD) Prof. Rudi Cassini (Maps, UniPD)
6.00 pm (CET)	Introduction of the blended iMOVES course Greetings from the Directors of BCA (Prof. Cozzi) and MAPS (Prof. Zotti) Departments	- Prof. M. Patrino (BCA, UniPD) - Prof. Cassini (Maps, UniPD)
8.00 pm (CET)	Animal welfare in farm animals: an Australian perspective	Prof. Peter White (Veterinary Medicine, University of Sydney – Australia)
Tuesday, 7th June	DAY 2	
4.00	Animal welfare in pets	Prof. Carlo Siracusa (School of Veterinary Medicine, University of Pennsylvania, USA)
	+ Student Activity supervised by facilitator*	
Wednesday, 8th June	DAY 3	
4.30 pm (CET)	The burden of seafood related-illnesses	Prof. Christine Budke (Veterinary Medicine, Texas A&M University - USA)
5.30 pm (CET)	Towards a safe, secure, sustainable, and authentic global food system: The illustrative challenges of the seafood trade	Prof. Justin Kastner (Veterinary Medicine, Kansas State University – USA)
	+ Student Activity supervised by facilitator*	
Thursday, 9th June	DAY 4	
4.00 pm (CET)	Animal Welfare of marine mammals and tourism interactions: a South African perspective	Dr. Greg Vogt (Conservation Guardians – KwaZulu Natal University – South Africa)
	+ Student Activity supervised by facilitator*	
Friday, 10th June	DAY 5	
4.00 pm (CET)	Control of transmissible diseases in Zoo animals	Prof. David Modry (University of Brno, Czech Republic)
	+ Student Activity supervised by facilitator*	

DEPARTMENTS OF BCA AND MAPS

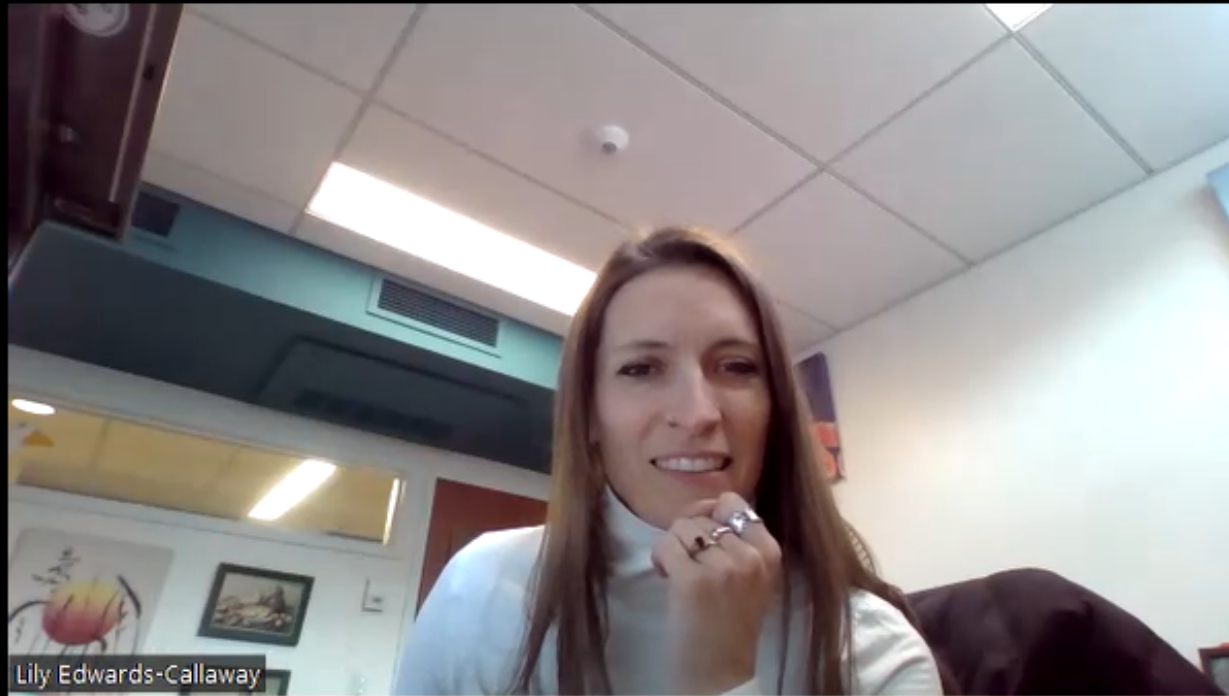


UNIVERSITÀ
DEGLI STUDI
DI PADOVA

2022 Edition, 2nd part, laboratory practicals and field trips in presence: nel caso gli studenti Americani non potessero presenziare a causa del perdurare della pandemia, saranno previsti collegamenti “live” dalle visite guidate e discussioni online nei pomeriggi (in presenza per gli studenti Italiani)

DATE/TIME	TOPIC	SPEAKER
Monday, 20th June	DAY 1	
1.30 pm (CET)	In presence and blended: Introduction of the week course (lectures, guided visit & laboratories)	- Prof. M. Patrino (BCA, UniPD), - Prof. R. Cassini (Maps, UniPD) Direttori e rappresentante Ateneo
2.00 pm (CET)	Safe and Sustainable Transatlantic Trade of seafood	Prof. Lorenzo Terzi (EU Spokesperson at the WTO SPS Committee, Brussels, Belgium)
4.00 pm (CET)	Food-borne pathogens: an overview	Prof. Giaccone (MAPS, UniPD)
Tuesday, 21th June	DAY 2	
Morning (CET)	Laboratory in the Agripolis Campus: Real-time PCR detection of food pathogens in seafood. (laboratory practical)	Prof. Fasolato Prof. Cardazzo (BCA, UniPD)
Afternoon (CET)	Animal welfare and risk assessment's	Prof. Peter Paulsen (University of Veterinary Medicine – Wien, Austria)
Wednesday, 22nd June	DAY 3	
Morning (CET)	Laboratory in the Agripolis Campus: Screening test for the presence of residues (laboratory practical)	Prof. Giantin; Prof. Dacasto (BCA, UniPD)
Afternoon (CET)	Conservation politics in the Mediterranean Sea. Pathogenic effects of parasites on cetaceans and sea turtles	Dott. Guido Pietrolungo & Dott.ssa Cinzia Centelleghes (BCA, CERT, UniPD) Prof.ssa Federica Marcer; Dott.ssa Erica Marchiori (Maps, UniPD)
Thursday, 23rd June	DAY 4	
Morning (CET)	Field trip to a poultry farm	Prof. Piccirillo, Dott. Laconi (BCA, UniPD)
Afternoon (CET)	Laboratory in the Agripolis Campus: online discussion & Dissection in necroscopy room (laboratory practical)	
Friday, 24th June	DAY 5	
All day	Field trip to FIORITAL spa (fish and seafood products – Venice)	Prof. Giaccone, Prof. Patrino
Saturday 25th	DAY 6	
All day	Guided visit to Parco Natura Viva Zoo	Prof. De Mori; Prof. Patrino

Product B: Presentation for CSU Graduate Students Animal Welfare and Food Safety



Stress -----

The real culprit?

- Immunosuppression
- Increased pathogen shedding
- Genetic selection



An animal's response to stress is the main mechanism through which poor welfare is translated into poor health and consequently to food safety problems (Humphrey, 2006; Rostagno, 2009)



Stress -----

Research

Insight #1

Impacts of individual animal response to heat and handling stresses on Escherichia coli and E. coli O157:H7 fecal shedding by feedlot cattle

Tami M Brown-Brandl ¹, Elaine D Berry, James E Wells, Terrance M Arthur, John A Nienaber

Affiliations + expand

PMID: 19459757 DOI: [10.1089/fpd.2008.0222](https://doi.org/10.1089/fpd.2008.0222)

- **No clear trends** between the heat stress levels or temperament scores (as an indicator of response to handling)
- This indicates that **neither heat nor handling stress** contributes to the food safety risk associated with E. coli O157:H7-positive cattle.

Stress -----

Research Insight #2

Factors Associated with Shiga Toxin-Producing *Escherichia coli* Shedding by Dairy and Beef Cattle

Cristina Venegas-Vargas¹, Scott Henderson², Akanksha Khare³, Rebekah E Mosci³, Jonathan D Lehnert³, Pallavi Singh³, Lindsey M Ouellette³, Bo Norby¹, Julie A Funk¹, Steven Rust⁴, Paul C Bartlett¹, Daniel Grooms¹, Shannon D Manning⁵

Affiliations + expand

PMID: 27342555 PMCID: PMC4968536 DOI: 10.1128/AEM.00829-16

E. COLI 0157:H7

- Prevalence higher in beef cattle (21%) than dairy cattle (13%)
- Considerable herd variation (range, 6% to 54%).
- Dairy cattle more likely to shed when:
 - >84 F
 - First lactation
 - <30 days in milk.

Stress/negative energy balance + lactation + high temps = increased shedding

Research Insight #3

Evaluation of Commercial β -Agonists, Dietary Protein, and Shade on Fecal Shedding of *Escherichia coli* 0157:H7 from Feedlot Cattle

James E. Wells ✉, Elaine D. Berry, Minseok Kim, Steven D. Shackelford, and Kristin E. Hales

Published Online: 1 Nov 2017 | <https://doi.org/10.1089/fpd.2017.2313>

- 1. RAC fed + addition of dietary soybean meal (SBM)**
 - a. RAC no impact, SBM reduced shedding
- 2. ZH fed + addition of 30% wet distillers grains with solubles (WDGS)**
 - a. ZH no impact, WDGS increased shedding
- 3. ZH fed + addition of shade over the feedlot pens**
 - a. ZH no impact, shade over the feedlot pens no impact

The health status of food animals can potentially influence foodborne pathogen levels in three ways.

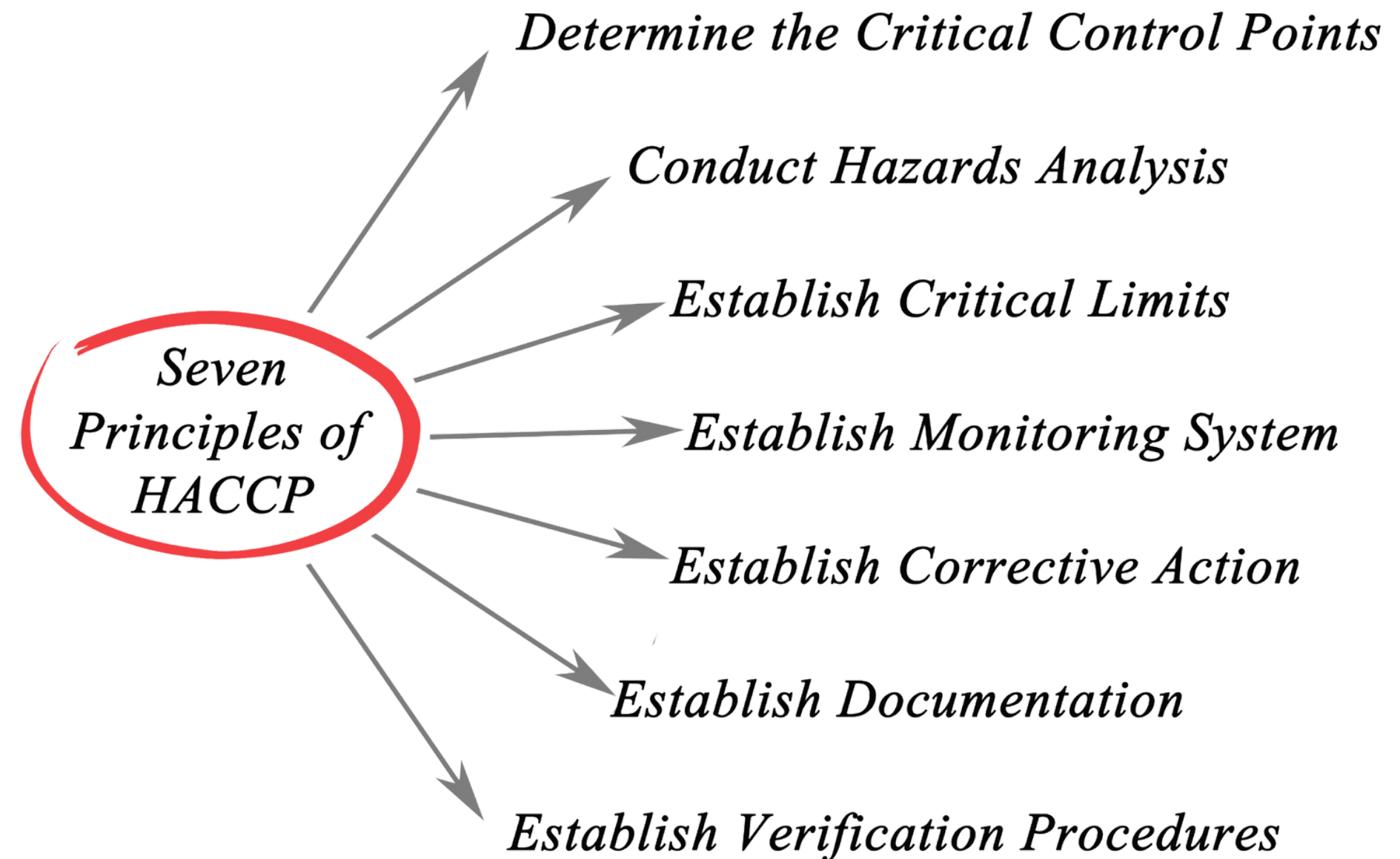
1. Diseased animals may **shed** higher levels of foodborne **pathogens**.
2. In the **processing plant**, carcasses that require **removing affected parts** may lead to increased microbial contamination and cross-contamination.
3. Certain animal illnesses may lead to a higher probability of **mistakes in the processing plant**, such as gastrointestinal ruptures, which would lead to increased contamination.

Singer, R.S., et al.



Food Safety & Animal Welfare: The Good News

- Management Plans
- Government Requirements and Inspections
- Similarities between HACCP and AW plans



Food Safety & Animal Welfare: The Good News

You can use this guide to develop, write, and revise your AW program.

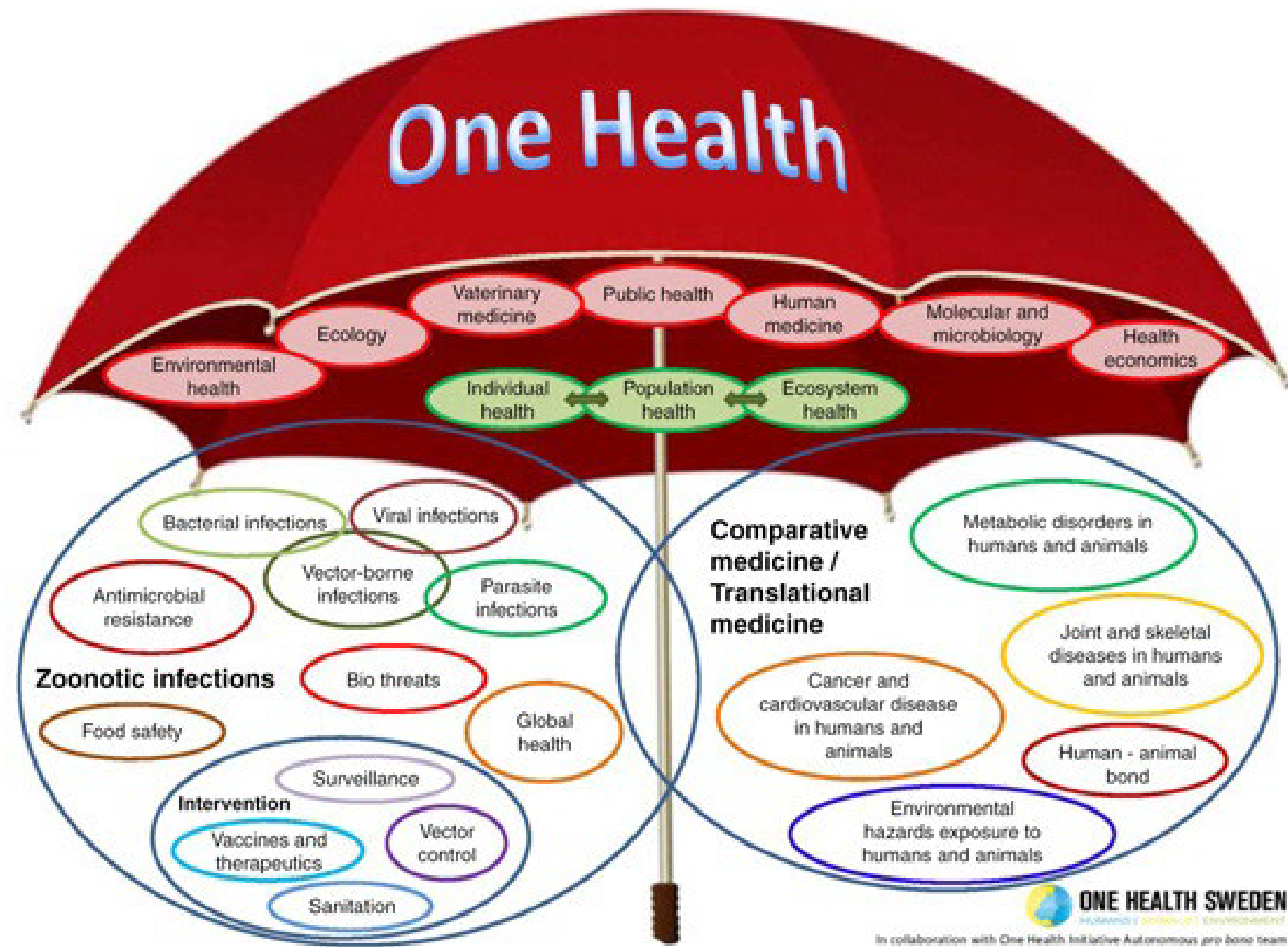
	Risk Assessment					Date Issued: 18 Aug 2020 Revision Date: Revision #:
CLOVERLEAF						Document Name: Risk Assessment
Production Step	Possible Hazard	CCP/POPA	Control measure	Critical Limit	Monitoring/Verification Procedure	Corrective Action
	Unsupervised unloading	1. Improper unloading practices 2. Improper trailer conditions	Unloading is to be supervised, gate locked	0% unsupervised unloadings without prior approval	Internal and/or remote auditing	Retraining and/or disciplinary action
	locked gates	1. Mixed animals. 2. Escaped animals.	Documentation procedures. Gates able to be securely latched.	100% gates properly closed, latched, and entry gate locked	Internal auditing and daily facility walks	Retraining, disciplinary action, or facility maintenance
	Water availability	Clean water should be supplied in all occupied holding pens 24/7	Provide water in all holding areas	100% areas that hold animals (15 min.+) have access to clean water 24/7	Internal and/or remote auditing	Water will be provided
	Facility Maintenance	Acceptable condition for receiving animals	Facility maintenance walkthroughs	100% of facilities are acceptable for receiving animals	Weekly facility condition walk	Repairs will be made before contuing to use area(s).
	Injury Points	No injury points	Internal auditing and daily facility walks	No injury points observed in the unloading area	Internal auditing and daily facility walks	Remove, fix, cover injury point before moving animals
	Slips/Falls	Slips/Falls	Housekeeping and minimzing stressful handling	100% of animals move to pens without falling	Internal and/or remote auditing	Retraining and/or facility cleaning or maintenance
			1. All EES and Mgmt working with animals should have training. 2.			

Product C: Blog Article

Animal Welfare and Food Safety: A One Health Approach



One Health





"Despite... having some of the most stringent animal health and welfare regulations globally, most groups of stakeholders were not trusted by respondents to provide reliable information about these systems, with respondents distrusting most supply chain stakeholders."

Clark, B. et al.

Perceived as a benefit			Perceived as a risk		
More cost-efficient production method	3.66 ± 1.07	★	Increased animal stress	3.88 ± 1.10	
Cheaper food of animal origin	3.65 ± 1.05		An unnatural production method	3.78 ± 1.10	***
Increased availability of animal based products	3.56 ± 1.03	★	Increased incidence of animal <u>diseases</u>	3.61 ± 1.08	
Greater protection from predators	3.42 ± 1.09	★	Reduced human <u>food quality</u>	3.56 ± 1.07	
Greater protection from bad weather	3.41 ± 1.09	***★	Compromised <u>FAW monitoring</u>	3.55 ± 1.06	
Benefits to agriculture	3.18 ± 1.14	★	Decreased consumer <u>trust in food</u>	3.51 ± 1.09	
More professionally run farms	3.12 ± 1.17	★	Reduced <u>nutritional quality</u> of food	3.50 ± 1.07	
Faster treatment of animal diseases	3.10 ± 1.20	★	Reduced human <u>food safety</u>	3.46 ± 1.08	
Benefits to consumers	3.07 ± 1.17	★	Negative effects on consumer <u>health</u>	3.42 ± 1.08	
Improved FAW monitoring	3.00 ± 1.25		An unsustainable approach to animal production	3.40 ± 1.05	
Improved human food safety	2.99 ± 1.25	★	Risks to <u>consumers</u>	3.34 ± 1.10	
Benefits to the environment	2.96 ± 1.17	★	Risks to your <u>family</u>	3.33 ± 1.11	
A more sustainable approach to animal production	2.89 ± 1.24	★	Slower treatment of <u>animal diseases</u>	3.31 ± 1.08	
Benefits to your family	2.89 ± 1.21	★	Risks to you <u>personally</u>	3.30 ± 1.01	
Improved consumer health	2.87 ± 1.26		Risks to the environment	3.27 ± 1.02	
Benefits to you personally	2.87 ± 1.22		Risks to agriculture	3.23 ± 1.04	***
Improved human food quality	2.85 ± 1.29		Less professionally run farms	3.04 ± 1.10	
Increased consumer trust in food	2.83 ± 1.25		Less protection from predators	2.91 ± 1.09	
Reduced incidence of animal diseases	2.80 ± 1.28		Non-cost efficient production method	2.78 ± 1.11	
Improved nutritional quality of food	2.80 ± 1.28	***	Less protection from bad weather		
A natural production method	2.54 ± 1.34		More expensive food of animal origin		
Reduced animal stress	2.52 ± 1.32		Decreased availability of animal based foods		

*** = p<0.002 Bonferroni adjusted p value, for Wilcoxon signed rank tests. Comparisons were made between each statement and the statement ranked by mean score.

12 of the Top
15 about FS,
PH, or AW!

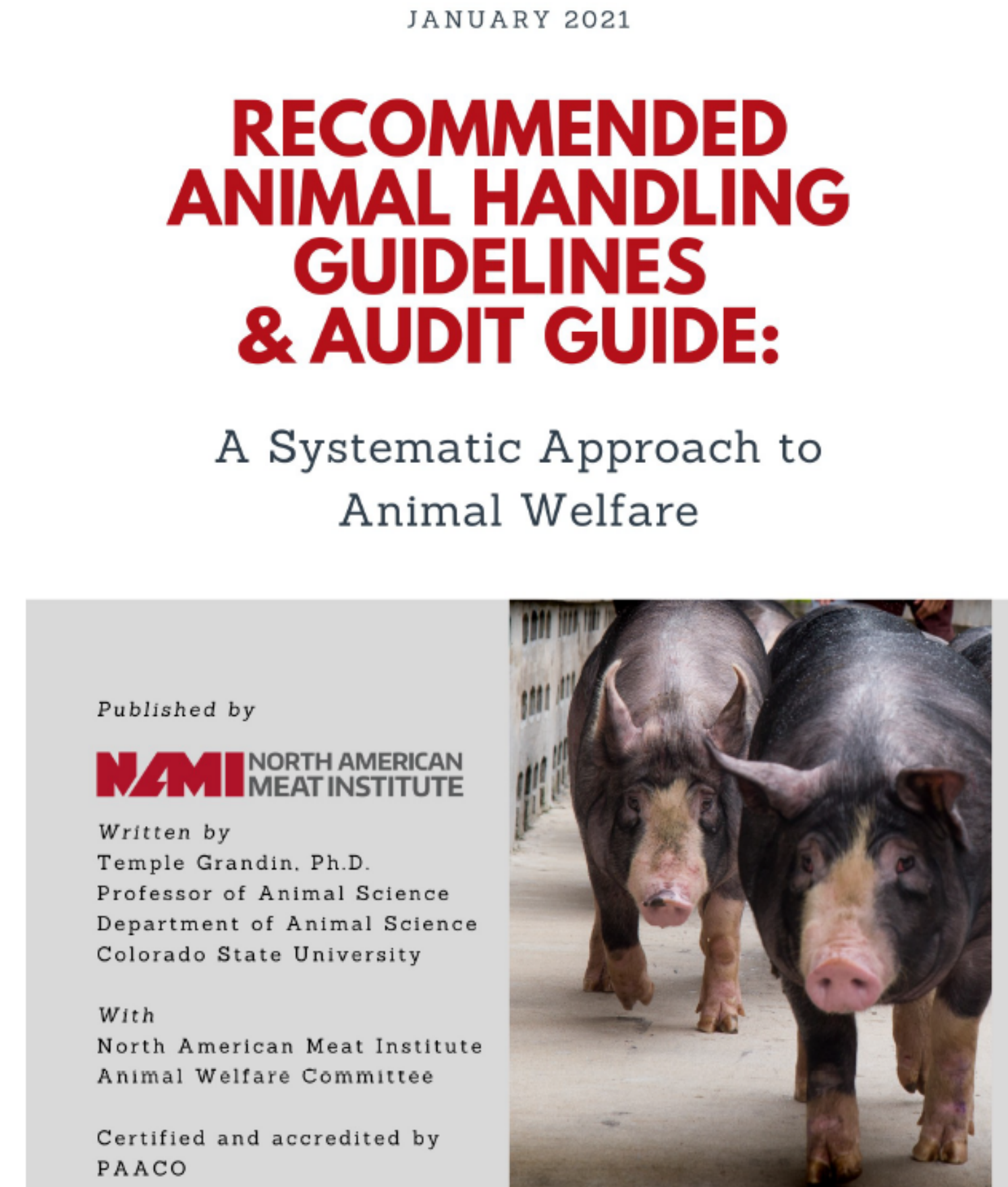


"Taking a One Health stance and approach...includes taking a good hard look at our industry...we can start by inviting and encouraging those from multiple industries to all have a seat at the table. This multidisciplinary approach may just be what we need to not only change the conversation, but to continue to improve animal welfare, public health, and food safety."



Product D: Standardized Bison Harvest Audit

- Many audits and guidelines
- No Harvest Audit for Bison
 - Using NAMI Cattle Audits
- Industry standard to use NAMI tool even across countries





≠



- **CSU Visit**
- **Data Collection**
- **Reviewed guidelines**
- **Independent Research**



Key Criteria / Elements

1. Critical Failures

2. Animal Handling

3. Training and Management

Commitment

4. Facility/ Tools

5. Records/Plans

6. Transportation

Project D – Standardized Bison Harvest Audit Tool

Date:

Auditor:

Plant Contact:

Location ID:

Country:

State:

Animals Processed/Hour:

Trucks Observed:

Weather:

Possible Points:

Points Scored:

Score %:

Result:

Issue Date: January 31, 2023

Revision Date: NA

Revision # 0

Document Name: Audit-Bison/Plant

Critical Failure *Any abuse of animals is a major non-conformance and an audit failure. Major non-conformances must be recorded and corrective actions made in all circumstances including retraining of all employees.		Pass / Fail		COMMENTS		
1	NO willful acts of abuse observed during the audit					
2	Are animals euthanized in a timely manner?					
3	If euthanasia is observed, are animals handled humanely during the process?					
4	If euthanasia is observed, do caretakers confirm insensibility and death after the euthanasia method is applied and before being removed from the facility?					
5	Zero sensibility is observed on the bleed rail.					
6	Animals have access to clean drinking water in holding pens.					
Animal Handling		Points	Yes / No	N/A	Points Scored	COMMENTS
7	Are animals handled properly for their age?	10				
8	Is proper handling equipment available and in good working order with no sharp edges?	10				
9	Can animal caretakers articulate or demonstrate appropriate equipment use during animal handling?	20				
10	Electric prods are used on 25% or less of animals in the lead up chute?	10				
11	Do 90% of the holding pens have adequate space allowance?	10				
12	Do 1% or less of the bison fall during handling?	10				
13	Do 3% or less of the bison slip during handling?	5				
14	Do 1% or less bison vocalize during handling?	10				
15	Are 99% of bison stunned adequately and appropriately?	25				
16	Do 40% or less crash into knock box?	5				
17	Do 25% or less crash into the knock box 2 or more times?	5				
18	2% or less animals observed have obvious, fresh injuries?	10				
Animal Handling - Section Points Total		130			0	
Training and Management Commitment		Points	Yes / No	N/A	Points Scored	COMMENTS
19	Management commitment is evident. (Committee involvement, trainings, etc.)	10				
20	Are handlers able to articulate and/or demonstrate the training they received specific to their daily duties, including handling and animal welfare?	10				
21	Are the handlers responsible for euthanasia able to articulate the site's euthanasia plan?	10				
22	If euthanasia is observed, are handlers following the site's SOP for euthanasia? N/A if euthanasia is not observed during the audit.	10				
23	Can handlers articulate the site's zero tolerance policy for willful acts of abuse and how to report abuse?	10				
25	Are handlers able to articulate and/or demonstrate the training they received specific to handling non-ambulatory bison?	10				
26	Does the facility train its personnel and have a written procedure or protocol about how to handle a sensible animal on the bleed rail?	10				
27	Does the facility provide special training to stunner operators to ensure proper equipment use and stunning efficacy?	10				
28	Are crowd pens less than 50% full?	10				
30	Are non-electrical devices the primary tool used to move livestock?	10				
Caretaker - Section Points Total		90			0	

COMPETENCIES & COURSEWORK

NOTEWORTHY COURSES:

- **Food Protection and Defense-Essential Concepts**
(Dr. Abbey Nutsch)
- **Trade and Agricultural Health**
(Dr. Justin Kastner)
- **Animal Care and Welfare**
(Dr. Abbie Viscardi)



COMPETENCIES

4, 8, 12, 16, 22

**SEE ILE FOR MORE DETAILS*



Thank you.

Questions?



References

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