

MAKERERE UNIVERSITY

AGSHARE PROJECT COMPONENT

**ACADEMIC PROGRAM: MSC LIVESTOCK
DEVELOPMENT, PLANNING & MANAGEMENT**

**COURSE MLD 7201: FOOD SAFETY AND
NUTRITION**

MODULE ON: DAIRY PRODUCTS QUALITY & SAFETY

**SCHOOL OF VETERINARY MEDICINE
MAKERERE UNIVERSITY**

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SECTION A: ORGANIZATIONAL COMPONENT

1. General premise and educational approach

1.1 Significance of this module

This module equips the student with a broad knowledge of quality concept, definition, inspection, examination, measurement, analysis and control; terminology in milk quality and safety, application of quality tools, intrinsic and extrinsic key quality characteristics of milk, quality concepts and a management quality system appropriate for milk industry as well as its certification scheme.

1.2 Module objectives

At the end of the module, the student should be able to;

- Plan and investigate milk quality and safety
- Apply and incorporate the principles of milk quality and safety systems in a real application.
- Apply the principles of quality assurance system to control and assure the quality and safe of milk products
- Understand government regulations related to quality assurance system required for the manufacture and sale of milk products.
- Identify and compare intrinsic and extrinsic quality characteristics of milk and milk products
- Describe specification and type of standards, and select a milk standard in milk processing system.
- Apply quality management tools to collect, organize, analyze and evaluate data
- Describe and compare the principles of quality management systems (ISO 9000:2000 series; HACCP and HAS) and apply them in a milk processing system

1.2 Educational approach

- Student-centered learning and teaching methods shall be applied.
- Case studies and open-education resources of the dairy value chain in form of videos, picture catalogues, publications and others shall be incorporated into lectures.

- Community field visits shall be undertaken stimulate the development of communication, interpersonal skills, group dynamics and service learning.

2. Contact information

	Name	Room No. and building	Telephone no. and E-mail address
Faculty	Associate Prof. Antony Mugisha	RM 411 Vet School. Bldg	Tel: (256) 772 502 887 Email: amugisha@vetmed.mak.ac.ug

3. Study materials

3.1 Important Text

- Jensen, C. O. 2010. Essentials of Milk Hygiene; A Practical Treatise on Dairy and Milk Inspection and on the Hygienic Production and Handling of Milk, for Students. General Books LLC. ISBN-13: 978-0217207362
- Wilhelm, E. 2010. Text Book of Milk Hygiene. ISBN-10: 1154904180
- Klein, L. A. 2010. Principles and Practice of Milk Hygiene. General Books LLC. ISBN-13: 978-1458898449
- Oski, F. A. 1977. Don't Drink Your Milk: The Frightening New Medical Facts About the World's Most Overrated Nutrient. 1st Edition. ISBN-10: 0671228048
- FAO/TCP/KEN/6611 Project. Milk testing and Quality Control. Milk Processing Guide Series: Training Programme for Small Scale Dairy Sector and Dairy Training Institute – Naivasha. Volume 2

3.2 References and selected readings

3.2.1 Further selected books

- Tamime, A. 2009. Milk Processing and Quality Management (Society of Dairy Technology series) ISBN-10: 1405145307

- Taufik, E. 2010. Microbiological Quality of Raw Goat Milk: Investigation on the Microbiological Quality of Raw Goat Milk and Its Associated Risk Factors. LAP LAMBERT Academic Publishing
- Smit, G. 2003. Dairy Processing: Improving Quality. 1st edition CRC Press
- PREJIT and Karthikeyan. 2010. Quality assurance and safety in liquid milk production: microbial quality control - Milk Production, Processing, Storage, Retailing. LAP LAMBERT Academic Publishing.

3.2.2 Journal Articles and Other Periodicals

Students will be asked to read and discuss relevant journal articles and other periodicals.

Lecture notes as well as other relevant study materials will also be made available to students.

3.2.3 Case Studies

Case studies/videos to be used in this course shall be drawn (but not limited to) from the following sources:

- AgShare case study videos
- AgShare case study picture catalogues
- AgShare thesis and non-thesis reports
- Dairy Development Authority Repository

4. Mode of Delivery

The course will be delivered through envisioning class lectures, field projects, case studies, role plays, and assignments. There will be 3 lecture hours per week for a 15 weeks semester. For each topic, references are given for reading. Students are expected to read this material before attending the lecture in which the material will be

discussed. Additional readings that will enhance students' understanding of the subject matter will be also provided.

5. Assessment Methods

The course will be evaluated through continuous assessment tests, home assignments, case study, and final exam as follows:

- Continuous Assessment 40%
(Homework assignments, Test, Case study)
- Final examination 60%

The pass requirement is 60% of the overall final mark.

SECTION B: STUDY COMPONENT

1. Module structure

This module is equivalent to 3 course units (CU) or 45 contact hours. The module duration is 15 weeks comprising of 45 lecture hours (LH). The module delivery schedule is systematically provided in the Appendix.

2. Module description

Topic 1: Introduction and foundational concepts

- Concepts of Milk Quality
- Concepts of Milk Safety

Readings:

- Klein, L. A. 2010. Principles and Practice of Milk Hygiene. General Books LLC. ISBN-13: 978-1458898449
- Oski, F. A. 1977. Don't Drink Your Milk: The Frightening New Medical Facts About the World's Most Overrated Nutrient. 1st Edition. ISBN-10: 0671228048
- FAO/TCP/KEN/6611 Project. Milk testing and Quality Control. Milk Processing Guide Series: Training Programme for Small Scale Dairy Sector and Dairy Training Institute – Naivasha. Volume 2

Topic 2: The Dairy Industry: Governance, Policy and Legislation

- Typical Milk Production Systems in Uganda
- Economics of Milk Production
- Dairy Development Policies in Uganda
- Cooperative Systems of Africa
- The Public and Government Agencies
- Advances in the Dairy Value Chain
- New Approaches in Technology: Cloning, factory farming, genetic engineering and the rise of Organic Dairy

Readings:

Case: Corporate Growth and the Demise of Small Dairies

AgShare Video: Milk Production practices & Systems in Kiruhura District

Questions

1. What milk production systems are in place and how have they evolved over time?
2. What is the role of milk to the economic development of Uganda?
3. What policy interventions would you recommend to improve the milk quality and safety in Kiruhura District and in Uganda in general?
4. What is the role of Cooperative societies in agriculture-based economies?
5. What are the current global trends that are addressing food security?

Topic 3: Infectious Contaminants of milk and milk products

- Basic Milk microbiology
- Sources of contamination
- Milk-borne infections (Brucella, campylobacter, E.coli etc....)
- Epidemiology and investigations of milk borne zoonoses
- Aspects of occupational health in milk production and processing.

Readings:

- Robinson, R.K. 1981. Dairy Microbiology: The Microbiology of Milk. 2nd edition. DA Information Services
- Srivastava, M. 2002. Handbook of Milk Microbiology. Daya Publishing House
- Boris Szyfres and Pedro N. Acha. (2001). Zoonoses and Communicable Diseases Common to Man and Animals. 3rd edition. ISBN-10: 927511580X
- William T. Hubbert and Harry V. Hagstad. (2000). Zoonoses: Recognition, Control, and Prevention. Wiley-Blackwell; 1st edition. ISBN-10: 0813825423

AgShare Video: Likely sources of microbial contamination based on milk handling practices in Kiruhura District

Case:

Questions

1. What are the commonest microbes isolated from milk and milk products?
2. Which sources in the production chain are associated with milk contamination?
3. What milk infections are common in the region and how do they manifest in humans?
4. How do you approach an outbreak of a milk-borne zoonosis?

Topic 4: Non infectious Contaminants of milk and milk products

- Chemicals
- Toxins
- Drugs
- Milk additives
- Parasites
- Environmental and;
- Naturally occurring substances

Readings:

- Wilber, J.F. 2010. Preventing Contamination of Milk
- Parker, R.J. 2010. Preventing milk adulteration and contamination (Current information series / University of Idaho, College of Agriculture, Cooperative Extension Service, Agricultural Experiment Station)
- Fuchs, AW. Contamination of pasteurized milk by improper relative pressures in regenerators
- Wilson, LG. The transfer of radioactive contamination from milk to commercial dairy products (Technical notes / Leatherhead Food R.A)

AgShare Video: Examining the Kiruhura ecosystem and environmental challenges

Case: Food Protein Contamination: 2008 Chinese Milk Scandal, Chinese Protein Adulteration

Questions

1. What domestic /industrial chemicals are likely to cause milk contamination?
2. What common farm toxins cause milk contamination at various stages of the value chain?
3. What aspects of the ecosystem are usually compromised to result into contamination in dairy production systems?

Topic 5: **Quality Assurance and Control of Milk and Milk Products**

- Quality assurance and control in the milk value chain
- Globalisation: World Trade Organisation, SPS Agreement, mandate of OIE and Codex Alimentarius as standard-setting organisations
- Role and mandates of international organizations (FAO; WHO) and of regional political/trade blocks (AU, EU, COMESA, CORAF, SADC, etc.)
- Quality assurance and certification schemes
- Good Practices (GAP, GVP, etc.)
- Principles of Hazard analysis critical control point (HACCP) and applications to food safety assurance
- Quality assurance in processing, packaging, transportation, storage of animal products

Readings:

- Spreer Edgar. (1998). Milk and Dairy Product Technology. CRC. ISBN-10: 0824700945
- Adnan Tamime. (2009). Milk Processing and Quality Management. Wiley-Blackwell. ISBN-10: 1405145307
- Jan T. M. Wouters and Tom J. Geurts. (2005). Dairy Science and Technology 2nd Edition. CRC. 2 edition. ISBN-10: 0824727630
- Ramesh C. Chandan, Arun Kilara and Nagendra Shah. (2008). Dairy Processing and Quality Assurance Wiley-Blackwell; 1 edition. ISBN-10: 0813827566
- Walstra. (1999). Dairy Technology: Principles of Milk Properties and Processes. Vol 90. Illustrated edition. ISBN-10: 082470228X
- Adnan Tamime. (2007). Structure of Dairy Products. Wiley-Blackwell; 1 edition. ISBN-10: 1405129751

- Trevor Britz (Editor), Richard K. Robinson. (2008). Advanced Dairy Science and Technology. Wiley-Blackwell; 1 edition. ISBN-10: 1405136189

Questions

1. How is quality assured and controlled at various stages of the dairy value chain (farm, milk collection center, processing plants and marketing stores)?
2. What international regulations play a role in milk trade and examine their relevance to quality and safety?
3. What is the role of HACCP in dairy plants?

Topic 6: Contemporary 'from-farm-to-table' approaches in Dairy Planning & Management

- On-farm approaches (Feeding, housing, milking practices, disease control, udder health and animal bi-products).
- Off-farm / handling approaches (transportation and processing)
- Consumer competences (handling, marketing, storage, processing)

Readings:

- Spilsbury, R. 2010. From Farm to Table (Food and Farming). 1 edition. PowerKids Press
- Basel, R. 2005. From Milk to Cheese (First Facts: From Farm to Table). Capstone Press(MN)
- Holthaus, G. 2006. From the Farm to the Table: What All Americans Need to Know About Agriculture. The University Press of Kentucky
- Food Forum, Institute of Medicine, Pray L and Yaktine, A. 2009.
- Managing Food Safety Practices from Farm to Table: Workshop Summary. National Academies Press
- Saunders-Smith, G. 2004. From Milk to Ice Cream (First Facts: From Farm to Table). First Facts Books

Case: A comparison of USA, European Union and African animal milk value chains: understanding the 'farm-to-table' global concept.

Questions

1. What modern production approaches ensure milk quality and safety?
2. What milk handling practices need to be globally improved in line with safety guidelines?
3. What lesson(s) do you draw from the European Union-Africa comparison case study?
4. How can the consumer compromise quality and safety?

Topic 7: Milk Quality Testing

- Milk sampling, equipment and techniques
- Milk sample preservation
- Common milk tests (organoleptic, COB, Alcohol tests, Resazurin tests, Gerber Butterfat test, Lactometer tests,, Rose Bengal, CMT and others)

Readings:

- ILCA Manual No.4, Rural Dairy Technology. Experiences from Ethiopia.
- IDF Doc. No.9002, Handbook on Milk collection in Warm Developing Countries. International Dairy Federation, Brussels, Belgium.
- Marshall, R.T. 1992 .Standard Methods for the determination of Dairy Products. 16th ed. Publ. American Public Health Association.

Video: AgShare Video: The procedures of tests done in Kiruhura during the baseline study by MAK students

Questions

1. What tests are undertaken to evaluate the safety of milk?

2. What tests are undertaken to evaluate the quality of milk?
3. What lessons can be drawn from the case study video and how do you relate it to the entire industry?

APPENDIX: DETAILED MODULE CONTENT & DELIVERY SCHEDULE

TOPIC	CONTENT	CONTACT HOURS	METHOD OF INSTRUCTION / Time allocated	TOOLS/EQUIPMENT NEEDED
Introduction	<ul style="list-style-type: none"> • Concepts of Milk Quality • Concepts of Milk Safety 	3	Interactive Lecture (3 hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector
The Dairy Industry, Governance, Policy and Legislation	<ul style="list-style-type: none"> • Typical Milk Production Systems in Uganda • Economics of Milk Production • Dairy Development Policies in Uganda and Africa • Cooperative Systems of Africa • The Public and Government Agencies • Advances in the Dairy Value Chain • New Approaches in Technology: Cloning, factory farming, genetic engineering and the rise of Organic Dairy 	4	Interactive Lecture (4 hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector
Infectious Contaminants of milk and milk products	<ul style="list-style-type: none"> • Essential Milk microbiology • Sources of contamination • Milk-borne infections (Brucella, campylobacter, E.coli etc....) • Epidemiology and 	4	Interactive Lecture (4 hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector

	<p>investigations of milk borne zoonoses</p> <ul style="list-style-type: none"> • Aspects of occupational health in milk production and processing. 			
Non infectious Contaminants of milk and milk products	<ul style="list-style-type: none"> • Chemicals • Toxins • Drugs • Milk additives • Parasites • Environmental and; • Naturally occurring substances 	4	Interactive Lecture (4hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector
Quality Assurance and Control of Milk and Milk Products	<ul style="list-style-type: none"> • Quality assurance and control in the milk value chain • Globalization: World Trade Organization, SPS Agreement, mandate of OIE and Codex Alimentarius as standard-setting organizations • role and mandates of international organizations • Quality assurance and certification schemes • Good Practices (GAP, GVP, etc.) • Principles of Hazard analysis critical control point (HACCP) 	4	Interactive Lecture (4 hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector

	<p>and applications to food safety assurance</p> <ul style="list-style-type: none"> • Quality assurance in processing, packaging, transportation, storage of animal products 			
Contemporary 'from-farm-to-table' approaches in Dairy Planning & Management	<ul style="list-style-type: none"> • on-farm approaches (• off-farm / handling approaches • Consumer competences 	3	Interactive Lecture (3 hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector
Milk Quality Testing	<ul style="list-style-type: none"> • Milk sampling and equipment techniques • Milk sample preservation • Common milk tests 	5	Interactive Lecture (5 hrs)	<ul style="list-style-type: none"> - Chalk/BB - Marker/white board - Slide projector - Power point projector