	Rwanda Dairy Competitiveness Program II	

RWANDA DAIRY COMPETITIVENESS PROGRAM II

Quarterly Report

October 1– December 31, 2013

CA# USAID-696-A-12-00002

Submitted to

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January 30, 2014

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QUARTERLY REPORT

October 1, 2013 – December 31, 2013

Name of Project:	Rwanda Dairy Competitiveness Program II
Regions:	Northern, Southern, Eastern and Kigali Milk Sheds
Dates of project:	January 6, 2012 – January 5, 2017

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Acronyms and Abbreviations

ABS	African Breeders Services, Total Cattle Management Limited
AI	Artificial Insemination
BDS	Business Development Services
COMESA	Common Market for Eastern and Southern Africa
COP	Chief of Party
DCA	Development Credit Authority
DCOP	Deputy Chief of Party
DPPD	Dairy Public Private Dialogue
DSWG	Dairy Sector Working Group
DQAL	Dairy Quality Assessment Laboratory
EADD	East Africa Dairy Development project
EDPRS	Economic Development and Poverty Reduction Strategy
EMMP	Environmental Mitigation and Monitoring Plan
ESADA	East and Southern Africa Dairy Association
IEE	Initial Environmental Examination
INGO	International Non-Governmental Organization
GoR	Government of Rwanda
MCC	Milk Collection Center
MINAGRI	Ministry of Agriculture and Animal Resources
MINECOFIN	Ministry of Economic Planning and Finance
MINEDUC	Ministry of Education
MINICOM	Ministry of Trade & Industry
MINALOC	Ministry of Local Government
MINISANTE	Ministry of Health
MS – DSWG's	Milk Shed – Dairy Sector Working Groups
MSME	Micro and Small Medium Enterprise
NDS	National Dairy Strategy
PLWHA	People Living with HIV and AIDS
PMP	Performance Management Plan
PSF	Private Sector Federation
PSTA III	Strategic Plan for the Transformation of Agric. in Rwanda – Phase III
RAB	Rwanda Agriculture Board
RALIS	Rwanda Agriculture and Livestock Inspection Services
RARDA	Rwanda Animal Resources Development Authority
RBS	Rwanda Bureau of Standards
RDB	Rwanda Development Board
RDCP II	Rwanda Dairy Competitiveness Program II
RMSA	Rwanda Milk Sellers Association
RNDB	Rwanda National Dairy Board
SOQ	Seal of Quality
SP	Service Providers
TOT	Training of Trainers
UCD	University of California – Davis

Introduction and Highlights

This is the quarterly report for the period October 1, 2013 to December 31, 2013. The Rwanda Dairy Competitiveness Program II (RDCP II) project was designed to reduce poverty through expanded marketing of quality milk that generates income and employment, and improves nutrition of rural households. RDCP II aims to achieve this by linking existing and new smallholder dairy producers to expanding market demand driven by improved quality, reduced transaction costs and increased investment all along the dairy value chain. Highlights for the past quarter ending December 2013 include the following:

Presentation of Draft Ministerial Instructions to the Dairy Sector Sub-working Group (DWSG)

Following prolonged consultations and interactions with the Rwanda Agriculture and Livestock Inspection Services (RALIS) and the Rwanda Agriculture Board (RAB), both agencies within the Ministry of Agriculture and Animal Resources (MINAGRI), under the auspices of the Dairy Sector Working Group (DWSG) RDCP II facilitated the development of draft Ministerial Instructions on Milk handling, transportation and storage. The purpose of the instructions is to streamline milk collection activities across country by providing set handling standards which MCCs and other milk outlets will be required to abide.

Figure 1: Rwanda Seal of Quality is considered a critical element in streamline milk collection and handling activities

This is further in line with the Seal of Quality Program and sets ground for operationalization of the program against which dairy businesses may be certified. RALIS as the lead agency collated all input from the DSWG session and has now submitted the final document to MINAGRI for review and approval.

Milk Zone franchising dialogue with Inyange industries

Building upon previous dialogue with Inyange industries about collaboration with the Rwanda Milk Sellers Association (RMSA), further progress has been recorded with the largest Rwandan dairy processor opening doors to partner with existing traders. As a result, Inyange has increased the distribution of Milk Zones from 10 to 21 over the last quarter. This has improved availability of clean healthy milk in key areas of Kigali city in a move to meet discerning consumer preferences

Figure 2: RDCP II has engaged with Inyange Industries in dialogue aimed to foster collaboration with Milk Sellers Association to establish Milk Zones

PSF starts RNDP restructuring

Private Sector Federation (PSF) during this period commenced with the restructuring activities of Rwanda National Dairy Platform. This was initiated following a press release announcing the grant to assist private sector enterprises in dairy to reorganize themselves and form a strong advocacy platform as proposed in the National Dairy Strategy. This initiative builds upon the former Rwanda National Dairy Board (RNDB) and will align the platform within the most appropriate institutional framework giving it the credibility needed to advocate for the dairy sector

Cheese makers follow up on-site training

Figure 3: On his feet, is one of the local cheese makers who have attended Cheese training program delivered by Kobus Mulder

Kobus Mulder, dairy processing expert and master cheesemaker, was in-country on a follow up master cheese training for selected cheese processors in Rwanda. Five cheeseries were chosen to host the training facilitated by the consultant. The unique and often difficult working environments in which Rwandan cheese makers operate also prompted RDCPII to adopt on-site training for the trainer, to help the consultant better understand the limitations and impediments for cheese processors in Rwanda. This provided an opportunity for both the trainer and trainee to share best practices under field conditions.

Figure 4: 8,000-liter insulated tank granted to Angeana Fresh Dairy Limited in Northern Rwanda

Grant equipment distribution

This quarter was very exciting for 14 grant recipients as a period of long waiting finally paid off with the arrival of dairy equipment as per the grant contracts. Among the equipment distributed was an insulated tank to transport milk, milk cooling equipment, milk cans, and cheese processing equipment.

USAID and RDCP II Management field visits

During this period, USAID visited field activities in the Southern province with RDCP II partners to assess progress on the implementation of the program. This visit, the first for USAID in the Southern province was an opportunity for the Project Management team to exchange ideas and information with the visiting AOR and her team about the range of enterprises that the project supports.

Figure 5: USAID officials carried out a field visit in the Southern Province

This also follows RDCP II management field visits across the key milk sheds in Northern, Eastern, and Southern Provinces, as well as Kigali. The purpose of the management field visits was to touch base with the field implementing team and project partners at district, sector and cell levels.

RDCP II has continued facilitating the training of service providers in every district. The service providers are then facilitated by the RDCP II to train farmers at sector level. The training focuses on improving dairy farmers' expertise in the areas of proper feeding of dairy cows, herd health including mastitis control, milk quality and handling, reproductive management, business and cooperative management, and gender mainstreaming in the dairy subsector. This training is relevant for the implementation of the RDCP II plans or the four core products/activities in relation to best practices i.e., the Feed Flow Plan, the Herd Health Plan, the Reproduction Plan, and the Clean Milk Production Plan and the SoQ. Participation at these trainings was as follows:

- 2,970 (967 female and 2,003 male) individuals trained (in Gicumbi, Huye, Kamonyi, Nyagatare, Musanze & Rulindo) in addition to 8,517 trained up to the end of last quarter making a cumulative total of 11,487 individuals trained including farmers.
- 2,117 (708 female and 1409 male) from trained farmers in Huye, Kamonyi, Nyagatare, Musanze & Rulindo received Mucuna forage legume seed while 300 farmers (78 female and 222 Male) in Musanze received Calliandra tree legume seed.

Figure 6:Farmers have been trained on usage of teat dip for mastitis

- 125 (99 male and 26 female) milk transporters, MCC staff, milk handlers and small processors (cheese makers) trained.

- 316 cows were inseminated by trained service providers in Kayonza and Nyagatare districts.

- Out of 181 cows checked for pregnancy after insemination, 80% were pregnant in Nyagatare District (Katabagemu Sector) and in Gatsibo District (Kiramuruzi Sector) while, overall, 60% out of 115 cows in Kicukiro District (Gahanga sector) were pregnant.

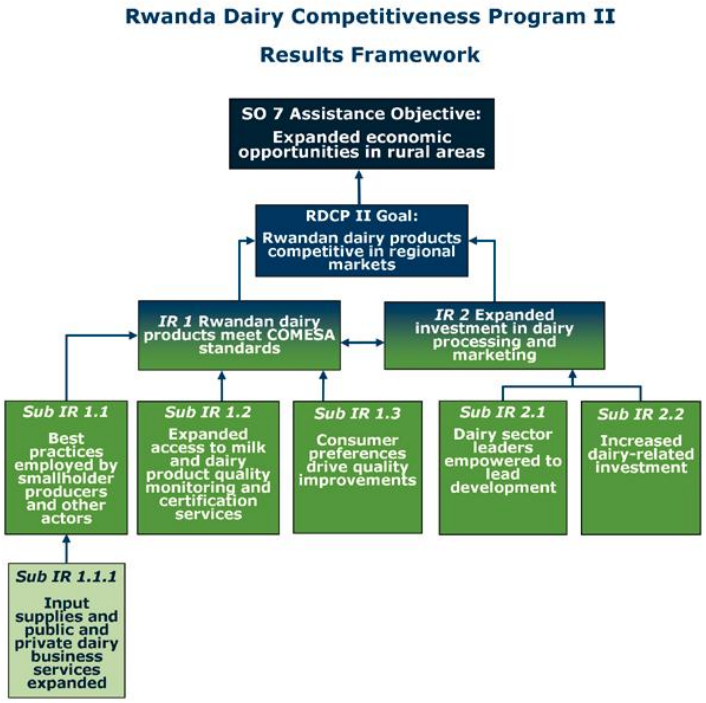
- 11 AI service providers selected, subject to approval, to implement AI programs across districts of RDCP II operation.

New dairy financial products and services launched

Figure 7: These were part of celebrations during the launch of dairy loan products by Duterimber S.A in the Eastern Province

By the end of December 2013, Duterimbere S.A and KCB Bank had their respective management approve dairy loan products for launch. The two banks joined Letshego (formerly RML) and UOB which had their loan products approved previously by their management. However, following sale of RML(now Letshego) to new investor's new management has revised their loan structure with a shift from group lending for which Inspired developed with them a loan product to individual lending previously not done by the bank.

Figure 1: RDCP II Results Framework



RDCP II Performance and Results

IR 1: Rwandan Dairy Products Meet COMESA Standards

Rwanda produces about 450 MT of milk annually which is largely marketed through poorly regulated informal routes. This results in losses to the dairy sector, both in volume and value of dairy products marketed. RDCP II aims to position Rwanda as a hub for high quality dairy products by benchmarking local standards to regional COMESA standards and working with sector actors to achieve the same through a reward mechanism for implementing a range of best practices under the Rwanda SoQ program. Progress has been made across the points in the dairy value chain in terms of dairy farmers trained and milk transporters engaged, as well as dairy processors and MCCs enrolled and encouraged to drive this process. Pre-audit visits to selected dairy enterprises under the SoQ program have been done and coupled with on-going monthly tests, and key information to advocate for dairy regulations has been obtained. RDCP II has worked closely with RBS, RAB and RALIS to ensure these agencies are well prepared to support this shift. At the end of the last reporting period, draft Ministerial Instructions had been developed and distributed for review by the Dairy Subsector Working Group. The Instructions are aimed at enforcing best dairy practices across the entire dairy chain form production through transportation and handling and processing. This will be the basis for a fully functional national inspection and certification program under RALIS.

Figure 8: This image highlights the need of better packing and branding of local cheese vis-a- vis imported products in region

Figure 9: The numbers of women involved in the dairy sector are steadily growing

IR1.1 Best practices employed by small holder producers and other actors

Key achievements:

- 2,970 (967 female and 2,003 male) individuals trained in addition to 8,517 trained up to the end of last quarter making a cumulative total of 11,487 individuals trained (see FTFMS table for disaggregation details).
- Included in the above are 2,845 farmers (843 female and 1,715 male) trained, among whom 2,117 (708 female and 1409 male) received

Mucuna forage legume seed while 300 (78 female and 222 Male) received Calliandra tree legume seed.

- 125 (101 male and 24 female) milk transporters, MCC staff, milk handlers and small processors(cheese makers) trained.
- 316 cows were inseminated by trained service providers (ERAGIC & Itabaza) in Kayonza and Nyagatare districts.
- Out of 181 cows checked for pregnancy after insemination, 80% were pregnant in Nyagatare District (Katabagemu Sector) and in Gatsibo District (Kiramuruzi Sector) while, overall, 60% out of 115 cows in Kicukiro District (Gahanga sector) were pregnant. The PDs were conducted by ERAGIC and Nyamata Agri-Inputs ltd, two RDCP II grant beneficiary service providers.
- 11 AI service providers identified and interviewed to implement AI programs across districts of RDCP II operation.
- 558 farmers and others have applied improved technologies or management practices during the quarter, making a cumulative total of 5,345 farmers applying improved technologies
- 763 new vulnerable household benefitting from the program, during the quarter, making a cumulative total of 4,638.
- 113 new micro and small enterprises supported during the quarter, making a cumulative total of 341 micro and small enterprises.

Consistent with achieving the four core products/activities in relation to best practices i.e., the Feed Flow Plan, the Herd Health Plan, the Reproduction Plan, and the Clean Milk Production Plan and the SoQ, RDCP II continued farmer training using trained service providers. The approach taken was as described in previous reports in which selected service providers were trained on the best practices and then used as TOTs to train farmers. The service providers or partners were largely from MCCs, The Rwanda Agriculture Board (RAB), milk processing and transport businesses, districts and sectors, and local financial institutions from the districts.

Implementation of Activities

During this quarter, RDCP II facilitated training and followed-up, through service providers and grant recipients, farmers in six districts (Gicumbi, Huye, Kamonyi, Nyagatare, and Musanze & Rulindo). In this regard, 2,845 farmers were trained. The farmers trained were from three sectors of each of Gicumbi, Huye, and Rulindo Districts, two sectors of Nyagatare, and one sector each in Kamonyi and Musanze. There was an additional 103 farmers (29 female and 74 male) that were retrained in Gicumbi District in response to requests for retraining during earlier follow-up visits. Overall, training activities were fewer than for the last quarter because of the festive holiday season. The training also fostered closer linkages between the farmers and milk buyers including MCCs, processors and financial institutions. With regards to financial institutions, after training sessions organized by INSPIRED during previous quarters, 113 farmers (10 Female and 103 Male) from IAKIB Cooperative submitted their applications for loan at UOB . The average loan applied for per farmer is Rwf 464,336 (USD 683.7), with a maximum of Rwf 1,000,000(USD 1,472.4) and a minimum of Rwf 50,000(USD 73.6).. These applications are currently under review.

Another example among other linkages created is a Milk Collection Center recently opened which was linked to farmers trained in Rulindo District. Karenzi

Milk Collection LTD was identified by RDCP and was linked to District Administration to get authorization, in June 2013, to run the MCC which wasn't operating for more than 2 years; an MOU was signed with the District and during the last quarter the MCC recorded an increase in milk supply. Karenzi Milk Collection LTD, a private business replaced a Cooperative which failed to manage properly the MCC until it closed by end 2011. Karenzi Milk Collection LTD initially was operating with no official registration but after orientation with RDCP II and District Administration he's now legally operating and paying taxes as required by local administration. From October 2013 the MCC is collecting 1,450 per day, with 14 milk collectors/traders collecting milk from farmers (414) and supplying it to the MCC. The price per farmer is 200 Rwf/L and the collected milk is directly shipped to Kigali City and sold at Rwf 260/L. The net profit for the month of November is estimated at Rwf 800,100 (USD 1,230).

As previously reported, farmers training topics included feeding and conservation of forage, and disease control. Farmers were trained on hay and silage making, impoving the quality of crop residues and conserved forages using molasses and urea treatment, making concentrates at home using home grown crops such as field beans, soybean and maize, and feed flow planning in order to maintain milk production across seasons.

Figure 10: A demonstration of molasses application on Napier grass to improve dairy cattle nutrition as well appetite, thereby increasing milk production

A total 2,117 farmers (708 female and 1409 male) of the trained farmers received Mucuna forage legume while 300 (78 female and 222 male) were given Calliandra tree legume seed. The farmers were expected to plant the seed and create a seed base for cropping larger acreages. As has been reported previously, the legume forage and seed can be fed as protein sources for ruminants.

In order to facilitate better germination rates, and hence availability of seedlings, one farmer in Busogo Sector of Musanze was selected to produce Calliandra seedlings from seed and later distribute the seedlings to other farmers. In Huye District, the District Office contributed 100 kg of Mucuna seed for distribution to farmers. The District considers Mucuna as a good legume for distribution because of its value as an animal feed and for environmental mitigation through restoring soil nitrogen.

Farmers in other districts have continued with efforts to establish fodder and legume plots for feeding cows, particularly during the dry season. Some MCCs including Ndego MCC in Kayonza district had to close during the last dry season as a consequence of inadequate milk supply caused by a shortage of feed during an unusually long dry season. In fact, farmers in Ndego Sector lost 413 cows

from starvation. In an effort to preclude such calamities, RDCP II assisted the farmers to establish pasture and legume plots to build dry season feed bases.

In this regard, Urwurirwiza limited company, saw an opportunity to supply cattle feed commercially and established pastures on 2.5 ha. It anticipates producing 10 metric tones per year of largely *Chloris gayana* (Rhodes grass) hay (Figure 7). However, the company has applied for a grant from RDCP II to improve the productivity of the pasture (quantity and quality).

Apart from Urwurirwiza Company, 50 members (26 female and 24 male) of Nyamiyaga MCC formed, through RDCP II facilitation, Abadahigwa Farmers' Cooperative which aims to commercially produce and sell forage, and pasture and legume seeds. For this purpose, the cooperative accessed 1.5 ha of land at Nyamiyaga MCC. From seed supplied by RDCP II, it planted Mucuna on the land (Figure 8). Because of the importance of conserving feeds in this relatively dry region of Rwanda, the Rwanda Agriculture Board (RAB) complemented the RDCP II assistance with the supply of *Chloris gayana* (Rhodes grass) for hay production and Desmodium spps forage legume seeds.

Of note is the strong participation of women in the Abadahigwa Farmers Cooperative. This indicates that women's participation in dairy activities could be increased through participation in commercial services and input provision. Also, the complementary support of the pasture and legume development activities by Huye District and RAB bode well for sustainability and up scaling of the activities.

Using hormones for cow heat synchronization obtained from RAB (GoR), Eastern Region Animal genetic Improvement Cooperative - ERAGIC, a RDCP II grant recipient, inseminated 300 cows for 300 farmers in Kayonza District from seed supplied by RDCP II while Itabaza Cooperative inseminated 16 cows in Nyagatare District. ERAGIC conducted pregnancy diagnosis on 181 cows in Katabagemu (Nyagatare District) and Kiramuruzi (Gatsibo District). Eighty per cent of the cows were pregnant. The beneficiaries of the AI program are largely from the GIRINKA Program that also received the RDCP II facilitated training described above.

In Kicukiro District, through RDCP II facilitation, Nyamata Agri-inputs Ltd completed the first pregnancy diagnosis of the 120 cows that it inseminated by the end of the last quarter. However, a total 115 cows were brought forward for PD. Overall, 69 cows were pregnant (60%) while the remainder were not pregnant. The non-pregnant cows were re-inseminated. This is a high success rate for insemination with sexed semen that often gives a pregnancy rate around 40%.

Farmer follow-up

By the end of this quarter, post training farmer follow-ups were conducted in Gicumbi and Musanze districts. In Gicumbi, 103 farmers (29 female and 74 male) received additional training from a service provider, IAKIB, facilitated by RDCP II on topics including feeding, and disease control. In Musanze, farmers were followed-up to assess planting of Calliandra tree legume seeds.

Surprisingly, in Gicumbi a total 648 farmers came for the additional training but 545 (84%) had not been trained before. These new farmers came for training because they had been informed of the usefulness of the training by their colleagues who attended the first training. During the additional training, two farmers who attended the first training, Jean Marie Muhiza and Festus Gakwisi, shared their success after implementing what they learned. During the last dry season Jean Marie used stored bean stover to feed his milking cow. After lacing the stover with table salt solution to increase cow appetite, he fed the stover to his cow. Unlike in previous years when milk production declined or stopped during the dry season, the cow maintained the same level of milk production (12 liters/day) across the dry season.

Festus Gakwisi made silage, conserved it for two months, and fed it to his cow in the dry season, again, unlike in previous years when milk production declined or stopped, the cow maintained the same level of milk production (14 liters/day) across the dry season. He also feeds home-derived concentrates to his cows.

In general, farmers mentioned the best practices that they have adopted including deworming, proper cow feeding, accurate heat detection, and record keeping. However, the farmers identified the key challenges they are facing such as mastitis, low milk prices, and limited availability of inputs (e.g., veterinary drugs) in some sectors. These challenges are to be addressed by service providers including IAKIB.

Follow up with farmers and SMEs that received Calliandra seeds revealed that direct planting of the seed into the soil does not give good results. The Calliandra establishes better when seedlings from nurseries are used instead of seeds. As a result, RDCP II selected farmers to establish nurseries that are already yielding positive results; for example, farmer Bigurumwami established a nursery bed that realized high germination rate.

The total number of farmers and others that have applied improved technologies or management practices during the quarter was 558 in addition to the cumulative total of 4,787 reported at the end of the last quarter, making an updated cumulative total of 5,242. As in the past, improved technologies included silage and hay making, use of treated crop residues, minerals, feed concentrates, cow vaccination, milking hygiene, and record keeping. The updated number of farmers that have applied improved technologies across the milk sheds will be updated during the next quarter after a farmer survey at the household level.

One hundred and ten (110) jobs were created this quarter (total converted to full-time equivalent). All the jobs were for transporters, MCCs and milk processors (See FTMS table). However, this does not include the jobs created at farm level, which will be tracked through the above mentioned survey to be conducted next quarter.

IR 1.1.1 Input supplies and Public and Private dairy business services expanded

Key achievements:

- 38 model dairy farmers identified after initiation of a program to identify and work with at least 20 model farmers in each district to enhance extension delivery. Model farmer identification will be finalized across all districts in the next quarter
- 11 AI service providers were selected for AI delivery through RDCP II grants and are awaiting USAID approval. These service providers will cover all RDCP II implementation districts.
- 125 (99 male and 26 female) milk transporters, MCC staff, milk handlers and small processors(cheese makers) trained.

Figure 11: Farmers have been encouraged to adopt best feeding practices to increase milk productivity

One of the two RDCP II grant recipients, Vetoprox in the Southern Milk Shed, that received animal feed processing equipment began operations. The other grant recipient, Nyagatare Agronomist Development Cooperative (Nadco) in the Eastern Milk Shed, has not started operations because raw materials were not available. However, it expects to begin operations after the current harvest. Vetoprox conducted a test run in which it produced 500 kg of dairy feeds. It sold the feed to six dairy farmers. Farmers who fed their cows with Vetoprox concentrate feeds got increases in milk production equivalent to, as normally expected, 2 liters of milk per kilogram of concentrate fed. Vetoprox has been distributing test feeds to MCCs and is negotiating to supply feeds to farmers through these MCCs and get paid using the milk payment check-off system.

One service provider, Veterinary Yield Entrepreneurs Cooperative (Itabaza) that received a capacity building grant for delivery of AI and veterinary extension services has realized initial progress in commercial service delivery. Itabaza participated in the Nyagatare District GIRINKA Week and Mini-Expo activities where it marketed its services. From this exposure, and the Radio Nyagatare slot it got to advertise its services and answer dairy best practice questions from listeners. Demand for Itabaza services including AI, veterinary drug supply and emergency veterinary services have increased, and Itabaza services have even extended to provision of veterinary and animal production consultancy services outside Nyagatare District.

Emergency veterinary service cases handled by itabaza increased from 1 case to 3 cases/month after receipt of RDCP II grant. Interestingly, monthly sales of veterinary remedies increased from USD 75 before the rdcp ii grant period to USD 630, an eight –fold increase, after the grant award.

However, with regards to insemination it is difficult to give an estimate as it varies with the number of cows synchronized during a given period. When heat synchronization is used, one inseminator can inseminate 100 cows in 2 days whereas one inseminator needs 30 days to inseminate 100 cows naturally expressing heat.

As the Itabaza service provision approach has potential sustainability and contributes to youth employment, it has attracted the attention of key government officials and politicians including a senator who has offered his farm to Itabaza for use in their capacity building. Itabaza consists of 18 young veterinary professionals (4 female and and 14 male), who have come together to provide quality vet services in the Eastern province. It is encouraging that vet graduates are willing to explore the private sector as a career option as opposed to entering the public service, which is the norm. While Itabaza prospects for commercial service provision are good, it does face challenges to service provision. In particular, there is limited availability of heat synchronization hormones (which can increase insemination rates) and Nyagatare District lacks a functional veterinary diagnostic laboratory.

In order to improve dairy extension services delivery, RDCP II began identification of at least 20 model dairy farmers in each district of operation. As at the end of this quarter, 38 model dairy farmers had been identified in Kayonza and Rwamagana districts; however, it has been difficult to find female model dairy farmers to achieve gender balance. It is hoped to have identified a total of 350 model farmers by the end of the next quarter, and these farmers will provide a basis for demonstration of best practices. Model farmers are chosen in collaboration and MCC's where possible additional selection parameters for identification were as follows:

- Have been trained by RDCP II directly or indirectly through service providers
- Is proactive in implementing dairy technologies that have increased milk production and ultimately household incomes
- Is a member of an MCC, dairy farmers' cooperative, or any other recognized group that supplies milk to an MCC
- Is producing or processing cheese or other dairy products with support from RDCP II
- Respected in her/his community as a progressive farmer
- Is prepared to share all dairy information needed by RDCP II
- Agrees to disseminating information to other farmers

- Demonstrates ambition to improve her/his dairy enterprise (e.g., increase milk production and quality).
- Farmers can be nominated by service provider, milk processor, MCC etc. but it is critical that are vetted by the field officer.
- Female Model farmer – a target of 50% female farmers.

RDCP II also identified 11 AI service providers across the districts of operation (see Table below). On receipt of grant approval from USAID, these service providers will initially provide their services though RDCP II grants funding. As has been experienced with ERAGIC in the Eastern Province, this will create farmer awareness on available AI service providers and increase demand for the service.

Table I: AI service providers identified across the milk sheds.

Milk Shed	District	AI Service Provider
Eastern	Gatsibo	AGROJOY Ltd
	Kayonza	HOBAS Ltd
	Rwamagana	BARICE Ltd
	Bugesera	Nyamata Agri-Inputs Ltd
Kigali	Kicukiro	Nyamata Agri-Input
	Gasabo	COOVIGI
	Gicumbi	COOVIGI
	Musanze	A.T.VET Ltd
North	Rulindo	A.T.VET Ltd
	Nyabihu	UPROCENYA
	Rubavu	BAIR
	Gisagara	SPAD Ltd
South	Huye	SPAD Ltd
	Kamonyi	NIR HOPE Ltd
	Nyanza	Nyanza Agro Center Ltd
	Ruhango	Nyanza Agro Center Ltd

General

RDCP II staff attended training on cooperative management and governance that was conducted by Ariong Abbey from LOL Uganda . He trained both RDCP II staff and staff from selected partner organisations including LISP and Inyange using modules from the Agricultural Producer Organization Manual (AgPro) to assess cooperative performance. The training session also involved a practical one day session at Dukundamatungo in Rwamagana. This management tool is now being used to help build the capacity and performance of RDCPII partner cooperatives and MCCs.

IR 1.2 Expanded access to milk and dairy product quality monitoring and certification services

DQAL Milk Testing

Figure 11: Some progress has been made, but there is room for improvement in regards to milk handling and hygiene across all milksheds

Milk and milk products sample collection and quality testing was conducted across all milk sheds to check for application of farm best practices, Good Hygiene & Manufacturing Practices at MCC and processor level. Products tested include: Raw milk, Pasteurized milk, Fermented milk ("Ikivuguto"), yoghurt, cheese and water. Quality parameters tested include Total Bacteria Counts, somatic Cell Counts, milk components, total coliforms, yeasts, moulds, heterotrophic counts and enterobacteriaecae in water. Samples were collected from 25 MCCs, 5 processors and 6 milk kiosks across all milk sheds.

Summary of findings reveal the following:

Table II Raw milk test results (Total Bacteria Counts) for 20 MCCs across the 4 milk sheds

Milk Grades	October (%)	November (%)	December (%)
Grade1 (≤200,000cfu)	0	5	28.6
Grade 2 (200,000-1,000,000cfu)	16	15	42.9
Grade 3 (1,000,000-2,000,000cfu)	32	30	9.5
N/A (>2,000,000cfu)	52	50	19.0
Total	**100**	**100**	**100**

As it appears in the table above, the milk quality across MCCs has improved significantly since October 2013. The percentage of MCCs with milk in 1st grade increased from 0% to 28%, and milk in 2nd grade increased from 16% to 42%. This means that the milk that meet the COMESA standard (1st and 2nd grades) passed from 16% to 71.5%.. This mainly due to RDCP II interventions in training on best practices across all milk sheds, provision of testing and milk handling kits and dairy equipment such as milk cooling tanks, pasteurizers and milk cans among others.

Figure 13: This MCC has increased milk volume from52,000 liters to 84,000 liters per month as a result of collaboration with RDCP II and partners such as district authorities

Training of milk handlers, MCCs staff and milk transporters was the focus of RDCP II intervention during the quarter, especially in Southern and Eastern Milk Sheds. Inyange Dairy Industries actively participated in conducting trainings in Eastern province from where 70 % of the milk purchased by to the plant is originating.

IR 1.3 Consumer preferences drive quality improvements

The closure of several yogurt makers in late December by RBS has raised the profile of the importance of adherence to standards and application of best manufacturing practices. The closure and subsequent national press coverage also raised the profile among the general public - possibly for the first time in Rwanda- that routinely consumed milk products such as yogurt and fermented milk produced without adherence to quality parameters can pose a significant health risk. In January 2014 RBS will begin to audit each processor on a case by case basis and will only allow them to reopen once standards have been adhered to which will include physical inspection and mandatory sampling. RDCP II has been working to raise awareness of product quality issues following the ongoing sampling by DQAL from June – Dec 2013. RBS visible commitment to resolving issues around product quality will have a positive impact on quality of dairy products available for sale and is a significant step to addressing an ongoing public health issue.

Figure 14: This cartoon appeared in national media (The NewTimes) reflecting public interest in milk quality issue

The above is very timely for the Seal of Quality program and emphasizes the importance of the initiative. Several more grant applications have been processed

that will involve distribution of additional basic testing equipment to MCCs across the milk value chain. These applications will be submitted to USAID for approval in Jan 2014. Pending approval of ministerial instructions it remains critical to have the basic testing ability and knowhow in place as it provides the basis for acceptance or rejection of clean milk.

IR 2: Expanded Investment in Dairy Processing and Marketing

Key achievements:

- 309,841 USD leveraged through partnership with investors in private sector ;
- 43,438 USD loan value approved by 3 financial institutions for the dairy enterprises
- 4.8Million liters of milk channeled through Milk collection Cooperatives
- Rwanda Milk Sellers' Association (RMSA) contracted Retail partnerships based on Milk Zone franchising with Inyange industries

Figure 15: These products belong to a small scale processor known as Zirakamwa Meza based in Southern Province. She produces fermented milk, yogurt among others

Dairy marketing in Rwanda is driven by poorly managed unregulated informal traders presenting a huge opportunity for investment in dairy processing and marketing. This component aims to identify and profile these opportunities to attract appropriate investment into the sector.

RDCP II is encouraging existing local processors to increase their capacity and upgrade their facilities as well as ensuring new comers find the ground prepared for investment. In doing so, the program has adopted a multi-faceted approach combining evidence based research and dissemination of information through various forums with stakeholders. In addition, RDCP II provides support to interested entities including banks and financial institutions that provide capital. This support ranges from product development, relationship building and confidence building between institutions to nurture new relationships.

RDCP II aims to increase public and private investment in human, asset and financial capital to enable Rwandan dairy products to become locally and regionally competitive. This calls for concerted efforts and increased stakeholder engagement to improve both policy advocacy and leadership development within dairy organizations and businesses.

IR 2.1 Dairy Sector Leaders Empowered to Lead Development

Private Sector Federation of Rwanda (PSF) has undertaken to work with RDCP II to reinforce dairy leadership nationally, with key engagement both centrally and at milk shed level. To this effect, PSF applied for and received a grant to facilitate grassroots mobilization of the various categories of groups that make

up the Rwanda National Dairy Platform as stipulated in the NDS. Activities under this grant are already underway . transporters. and it is anticipated that , PSF will both guide and facilitate the formation of a fully representative and accountable institution that upholds the values of the membership and the wider dairy sector. This will also enable the alignment of the new RNDP with the broader PSF mandate of ensuring high level advocacy for the associations under its umbrella. This activity is aligned with the NDS recommendation of the importance of having a body that represents the dairy sector in a professional and credible manner. Partners included under this umbrella include producer associations, processors, input and service Providers, traders/milk sellers and transporters. Organizations including the Rwanda Cheese Makers Association, Rwanda Milk Sellers Association, National Farmers Federation, etcetra.

Build capacity of RNDB and DSWG

PSF have undertaken several initiatives since receipt of the RNDP restructuring grant among them are the following;

- **Press conference and public launch**

A press conference by both PSF and Land O'Lakes on the award was held on December 6th, 2013. The press conference was attended by the Chief of Party for RDCP II, and the Deputy Chief of Party and PSF Chief Executive Officer Mr. Namara Hannington, various actors along the dairy value chain under the RNDP and media houses. This whole event was facilitated and coordinated by the PSF-Grant Management Unit.

- **Consultative meetings with key stakeholders**

In order to raise awareness of the grant activities among the key stakeholders and to fully engage them in the establishment of an all-inclusive dairy sector platform, several meetings with key players and stakeholders were held to secure consensus and buy-in on the role of RNDP. The first meeting was between the PSF-Grant Management Unit and the MIFOTRA legal staff, second was a stakeholders' meeting together with the RNDP interim board members to discuss the road map for registration of RNDP, the third meeting was between legal officers from PSF, MIFOTRA and RCA to iron out the legal issues impeding the RNDP registration process, lastly was another stakeholders' consultative meeting to discuss the program for creating awareness and mobilization campaign. We are glad to report that all the meetings have been yielding positive results towards the execution of the activities described in the grant agreement for establishment of the dairy sector platform

Finalizing the registration process of RNDP

The PSF Grant Management Unit had a meeting with the Legal Officer of the Ministry of Public Service and Labor (MIFOTRA) on December 4, 2013 to seek a clarification on the causes of the delay of the RNDP registration process. The MIFOTRA lawyer pointed out key legal issues impeding the registration process of the platform. This in turn prompted PSF to convene a stakeholders' consultative meeting to discuss the road map for registration of RNDP on December 11, 2013, this meeting recommended that legal officers from MIFOTRA, PSF and Rwanda Cooperative Agency (RCA) converge for a meeting to iron out legal issues impeding the registration of RNDP and make a joint report

for further actions. The lawyers from MIFOTRA, PSF and RCA met on December 18, 2013, agreed and reported that there is no legal obstacle whatsoever impeding the registration of RNDP they thus advised that the statutes be reviewed, notified and submitted to MIFOTRA to seek legal personality for the platform. Following another stakeholders' meeting organized by PSF on December 30, 2013 deliberations were made that a dairy sector platform General Assembly sit on January 30, 2014 to put pen to paper on the statutes so that they can be notified by the Kicukiro district registrar on the same date for submission to MIFOTRA on January 31, 2014. In the same line a taskforce was enacted to revise and redraft the statutes which will be submitted to PSF not later than January 10, 2014.

- **Development of information packages to be used in mobilization campaigns**

The information packages have been developed and PSF will use the grant to procure services for printing out brochures and flyers. These materials will be used to disseminate information on activities related to the establishment of RNDP during the next quarter.

Strategic plan for RNDP

As part of the capacity building effort through a USAID grant, PSF has started a process to procure services of a consultant to develop a 5-year strategic plan to position RNDP to effectively participate in the National Dairy Strategy implementation process. Terms of reference to hire a consultant/consultancy firm to design a five year strategic plan were developed and PSF has advertised the consultancy offer of which the tender documents are now available at the PSF secretariat in Gikondo. In addition, PSF is currently sourcing for a consultant to develop operational manuals to facilitate efficient and effective management of RNDP resources.

Dairy Sub working Group Meetings

RDCP II has remained at the center of the activities of the DSWGs with the highlight for this period being the presentation to the working group draft Ministerial for milk handling, storage and transportation. RDCP II in collaboration with MINAGRI Directorate of Animal Resources facilitated a well-attended session of key dairy partners from both the public and private sector.
This was for the dairy stakeholders an opportunity to bring to prominence quality issues that continue to derail sector growth to compete favorably and yet the steps required to change this undesired trend are basic.

To elaborate this, RDCP II presented results of milk testing for the period June to September 2013 which illustrated the gravity of the matter with milk tested at many locations failing on various tests. This situation can be corrected by strict enforcement of hygiene practices during milk production, transportation handling and storage which the Ministerial Instructions detail. It's anticipated that the approval and issuance of the same by the Minister of Agriculture will send a strong signal of commitment to milk quality to the entire network of dairy stakeholders particularly those involved at primary production. Presentation of

this information precipitated the RBS investigation and subsequent closure of yogurt facilities in December and supports the need to implementation regulations that have a direct benefit in the area

Facilitate institutional and association capacity building

During this quarter RDCP II continued to build on the positive energies of key associations, cooperatives and institutions involved in the dairy sector. RDCP II has continued to mobilize different cooperatives to submit applications to Rwanda Cooperative Agency (RCA) as a step towards legal registration as cooperatives that were facilitated to get legal registration include Agiragitereka Huye cooperative & Kibilizi dairy farmers Cooperative.

Others that are being facilitated to function:

- Uruyange cooperative in Kisaro sector, Rulindo district is now collecting 2,000 liters per day
- Gasabo Zirakamwa Cooperative, which had completely stopped functioning, is now fully functioning again, with up to 1,600 liters collected per day. This and Uruyange have been linked to ANGEANNA dairy.
- CTSOR was bulking warm milk. Having received the grant of a cooler and cans, milk is now delivered in cans and chilled. This has facilitated their prices to increase from 160rwf to 200rwf per liter as a result of RDCPII's effort to link them to a milk buyer ANGEANNA.
- Facilitated KABU and Tugemure cooperatives without coolers to bulk and market their milk together with Kamu Zirakagwira in Mudende sector.
- Tuzikamire kabumba women cooperative was bulking warm milk. They have been facilitated to start bulking with KOAIBU Urumuri MCC which has coolers and a generator and as a result their selling price for milk has increased from 125rwf to 140rwf per liter
- Through grants awarded to cooperatives, institutions and companies/ enterprises anticipated results range from improved milk quality, increased access to and consumption of milk, increased revenues from more efficient routine operations
- Cooperatives in Nyagatare union were facilitated through a training on Gender mainstreaming and integration, Cooperative development & Proper management of the cooperative. Participants involved were MCC Managers, Accountants, Veterinary officers & milk receivers from 12 dairy Cooperatives from Nyagatare district. In total 26 MCC staff members 12 male, 14 Female (girls and women) out of which 24 were youth. Success registered included that 90% contended that their perception about gender mainstreaming greatly improved and they indicated that the

management of the cooperative will change for better given the skills transferred to them.

On-site Cheese processing training

RDCPII and Rwanda Cheese Makers' Association joint evaluation team in October visited cheese makers to assess progress of improvements at their cheese factories as laid out in the Quality Improvement Plan (QIP) . During this visit, the joint team selected the most improved facilities to host the on-site training by International Dairy Consultant Kobus Mulder who returned for a 2-week follow up course in December.

On this mission, the consultant aimed to achieve the following purpose;

- Highlight the importance of availability of clean raw material i.e. milk that is required to manufacture value added dairy products including cheese, yogurt and fermented milk.
- The importance of the availability of correct packaging options for dairy products
- The relevance of dairy products standards as they relate to composition and microbiology standards

The consultant worked with selected cheese trainees' at their factories with hands-on practical demonstrations at their cheeseries as part of the ongoing initiative to upgrade the quality of cheese in Rwanda.

Attendees at Cheese training and venues

CHEESE MAKERS TRAINING			
Name of Cheese maker	**Topic of training (Type of cheese)**	**Number of staff trained**	
		Male	Female
Ingabo Dairy Ltd	Gouda cheese	7	
Ubumwe Ltd	Gouda cheese	1	
Les caves de l'abondance	Gouda cheese	1	
Gishwati Montain Farm	Gouda cheese	3	
Fromagerie la Reine	Mozzarella, Cheddar and Gouda cheese	3	2
Gishwati Farms	Mozzarella, Cheddar and Gouda cheese	1	
Muhe Farm	Gouda cheese, Camembert	8	
Fromagerie Urugero	Gouda cheese, Camembert	1	
Blessed Dairies	Gouda cheese	4	
	TOTAL	**29**	**2**

Milk Zone franchising progress

Figure 16: These are newly established Milk Zones which have lowered the prices of pasteurized milk to consumers

The milk zone concept involves Inyange contracting with individuals who are committed to managing a milk kiosk to an agreed standard under a franchise arrangement. The kiosk sells pasteurized Inyange milk under agreed hygienic conditions from a refrigerated cooling tank and hot water cleaning facilities must be present. In return use of Inyange brand is permitted and Inyange provides support to 'brand' the outlet in Inyange colors. Milk Zones are operated as privately owned businesses and are independently managed.

Following prolonged discussions between the Rwanda Milk Sellers' Association (RMSA) and Inyange Industries opportunities and gaps in the sector that both parties could exploit, and retail partnerships have been developed.

Over the last quarter, **10** additional new milk zones have been opened under this arrangement with the Milk vendors. This makes the cumulative number of milk zones 21 by the close of December 2013.

Key developments among the partnerships in this quarter included:

New Milk Zones opened; Inyange Industries accepted RDCPII offer to act as liaison on discussions with RMSA members to develop a Milk Zone franchising concept. This initiative attracted the attention of the key milk sellers. Inyange advertised a tender to open **7** more milk zones through the Milk Sellers' Association. This tender will become effective in the first quarter of 2014.

Improved milk supply linkages and potential partnerships

Dialogue between several large milk haulers and Inyange continued in this quarter, Angeana Fresh Dairy limited had increased its supply to Inyange from 15,000 liters to 20,000 liters per day. This has boosted the growth of Angeana Fresh Dairy Ltd., which received a 8000 liter capacity insulated tank to improve their supply of high quality milk to Kigali.

In addition, MUDACOS cooperative under a joint partnership with Rwimbogo Dairy Farmers cooperative secured a contract to supply 4000 liters of milk to Inyange. This follows delivery of milk handling equipment delivered to MUDACOS in the last quarter. The joint efforts of both cooperatives guarantee a steady supply of milk and benefit both logistically by pooling their efforts.

IR 2.2 Increased Dairy-Related Investment

Coordinate and leverage industry investment

Inyange

During the last quarter, Inyange Industries procured 18 dairy cooling tanks earmarked for the Milk Zone expansion program and worth **Rwf.166,119,840 (USD 244,610)**. This followed on-going collaboration under the Milk Zone franchising model. RDCP II on the other hand worked closely with the Milk Sellers' Association to mobilize membership of the program. This had led to an additional **10** new entrants in the Milk Zone business. This was achieved with strong engagement of the Milk Sellers' and open discussion about the opportunities in the dealership as well as financial returns analysis. However, the investment in the Milk Zone business much as it is a lucrative business did not immediately appeal to all the milk vendors given the high initial capital investment. As of December 31, 2013 a total of 21 milk zones are now in operation across Kigali city. Inyange has an ambitious expansion plan and aim to reach at total of 40 by end of March 2014.

Promote Investment

Investment promotion is a key milestone for RDCP II. INSPIRED International, LLC was contracted to complete the '*Deep Dive'* analysis related to value added investment opportunities. The initial investment analysis commenced during November and included regional analysis to identify key opportunities both in terms of where and which products demonstrated the best potential return on investment. Throughout this activity, RDCP II will collaborate with RDB to complete the analysis and a further visit is planned by INSPIRED during January 2014 with a presentation of findings as per phase one due in February 2014. Ultimately the analysis will highlight key areas for investment advice and potential leverage at the time of investment.

Milk consumption campaign

During the last 3 months, RDCP II pre-selected and interviewed 3 potential companies to run the milk awareness campaign and emerging top among them was Creative Communications Limited. The campaign is aimed at raising the profile of milk and dairy products and increasing per capita dairy consumption in Rwanda. RDCP II has started the contracting process for the assignment and will identify a host institution between Minagri, RAB and RDB. This will require detailed discussions between the institutions mentioned to understand the nature of the campaign and their host role. The above consultations will be done in the second quarter, starting January 2014.

Stimulate supply and demand for dairy-related financial services

Together with INSPIRED and Duterimbere, RDCP II facilitated the launch of "Gira Mata" financial product in Kirebe of Nyagatare district; 81 individuals (including farmers, MCC leaders, private SPs, Union and MCC staff) attended.

Facilitate investment in underserved markets

Duterimbere launched both savings and credit products targeting the Nyagatare milk shed in October 2013. Since October, the MFI has enrolled 137 savers with a total savings value of RWF 315,100(USD 463.9) The MFI has also accepted 13 applications for financing improved dairy animals valued at approximately RWF 10.4M(USD 14,724.9). These loans are under review and disbursement of some of these is expected in February.

Figure 17: 'Gira amata' is a dairy loan product recently launched at an MFI known as Duterimbera. Gira amata is loosely translated as "May you have milk".

KCB's Board of Directors formally approved the dairy loan product in December 2012 after various administrative delays. KCB is offering an asset loan, a savings product and an invoice discounting facility. KCB has been preparing marketing materials during the months of December and January. The banks are now actively pursuing business in Rwamagana and Gicumbi and has begun registering agencies through which they can disburse and recover finance.

Letshego began offered dairy loans immediately after receiving training but did not undergo a formal launch event. During the month of November the MFI made a single loan of RWF 3M(USD 4,417.5) to a dairy located in Nyanza for processing. Unfortunately, Letshego has suffered many internal challenges (unrelated to the dairy sector) as they were recently purchased by a foreign company and have undergone many changes to their operations, staffing, systems and products. Letshego has informed INSPIRED that they are no longer positioned to offer the products they have been supported to offer.

UOB began actively pursuing dairy finance in December of 2012. The bank is working through the cooperative sector in various milk sheds including Rwamagana and Gicumbi. There were long delays in offering the product as the bank sought a refinancing facility from an American institution which was only agreed in December. UOB approved their first loan of RWF 16.5M(USD 24,296) for a truck to transport milk to Rwamagana based MCC . In December 2013 113 farmers (10 Female and 103 Male) from IAKIB Cooperative submitted loan applications . The average loan applied for per farmer is Rwf 464,336(USD 685.2). These applications are currently under appraisal.

Monitoring & Evaluation and Knowledge Management

During the reporting period, M&E department continued to support all activities related to tracking and reporting performance indicators across the program.

The beginning of the quarter (October 2013) was dedicated to reporting the 2013 annual results to USAID through the Feed the Future reporting system (FTF MS system) and the Partners Reporting and Performance Management System (PRPMS). In addition the M&E Department, with the support of Land O'Lakes HQ undertook the process of uploading the beneficiary & activity data into the web-based database, IMPACTS System, managed by Land O'lakes IDD HQ.

During the last quarter, RDCP II finalized and submitted to Donor for review and approval the 2014 program work plan, and its presentation was done at the USAID Mission in Kigali.

By the end of the quarter, an annual review and planning workshop was organized for all RDCP II technical and field staff to review together the 2013 annual achievements and challenges, and to make plans for 2014.

During the workshop, the staff was updated on all M&E data collection tools and reporting systems, and a refreshing training on data management was also provided to ensure a smooth and standardized data collection and reporting process.

Gender Mainstreaming

In collaboration with the sub-award grant team follow up of awardees was made to ensure that at least 50% of female members have access to and control over grant equipment and services offered by RDCP II - the project emphasizes that at least 50% of beneficiaries should be female.

In collaboration with INSPIRED, financial institutions agreed that women will have the opportunity to benefit from opportunities whether they are financial, technical, or any service/support that the institution offers. As a result of which, LETSHEGO MF and Duterimbere SARL agreed to include an equal opportunity statement of "Females are encouraged to apply" in the advertisements for financial service products.

Female participation in training events has increased. This can be gauged from cooperatives such as Tuzikamire Kabumba, Agiragitereka, Rwabiharamba and Dukundamatungo cooperatives that have increased from very low levels of female participation, less than 10 %, to now approaching 35 %% of their leadership committees are women. Dukundamatungo have put in place a small credit and loan box for female members to borrow at zero interest rate while maintaining a low interest rate on females who are non-cooperative members. This has encouraged a number of female farmers to submit their request to become members of the cooperative.

The ability for women to solve/address issues that face them has become more apparent. For example, CTSOR cooperative, dominated by females were scared to claim their rights when their female leader did not serve them appropriately. They presented their concerns to the local authorities and followed up until their issues were/ are rectified. Thus women in this Cooperative have repeatedly testified that they feel valued and problem solvers.

Feedback from beneficiaries in RDCPII meetings that the negative attitude that males previously had towards females is changing significantly. Positive examples include female & males now recognize that females can attend meetings, own a cow, do artificial insemination and train others. Female service providers now number approximately 40% across all 17 districts of RDCP II operation. Also female cooperatives have reported improved revenues from milk sales following continued interaction and facilitation. This includes Tuzikamire Kabumba's female cooperative that was bulking warm milk in jerry cans but now with RDCPII's facilitation have signed MoU with KOAIBU Urumuri cooperative where they are able to bulk their milk and only pay operational expenses. This resulted in their milk price per liter increasing from 125rwf to 140rwf.

Grants and Investment

During this quarter, several dairy enterprises received equipment from RDCP II. Following a lengthy procurement process, grantees were excited to receive the said equipment and have started to utilize the same.

Figure 18: This tricycle that was photographed while transporting milk in the southern Rwanda was one of the equipment granted to various stakeholders across the country

Last quarter, Land O' Lakes issued subaward agreements to the following organizations:

- Private Sector Federation (PSF) who will establish and strengthen the Rwanda National Dairy Platform.
- University of Rwanda/ College of Agriculture, Animal Sciences and Veterinary Medicine – Bosogo Campus and Nyagatare Campus, where both campuses intend to build clinical microbiology capacity of their staff on the detection of mastitis, assessment of milk quality and in dynamic dairy management systems for the benefit of smallholder farmers and their dairy animals.
- Rwanda Agriculture Board (RAB) which intends to build the capacity of their staff in mastitis microbiology techniques on the identification of control and management of mastitis.
- Dairy Quality Assurance Laboratory (DQAL) which intends to build the capacity of their staff in mastitis microbiology techniques on the identification of control and management of mastitis.

The subaward signed with Busogo campus, Nyagatare campus, RAB and DQAL includes travel to the United States for one staff per organization to be trained in clinical mastitis microbiology for two weeks at UC Davis laboratory facility. Unfortunately, the visa applications for 3 of the staff – those from Busogo campus, RAB and DQAL - were rejected. RDCP II is currently organizing alternative training options for these candidates, and most likely training will proceed in Rwanda in collaboration with RAB at the Rubarisi facility in Kigali. UCDavis has prepared a comphrenhensive step by step clinical micobiology training workbook in advance of the laboratory training.

Land O' Lakes started the procurement process for the purchase of laboratory equipment for Busogo campus and Nyagatare campus.

The table below is a list of items and their respective recipients.

GRANT EQUIPMENT DISTRIBUTED IN Q1 (OCT-DEC)

Grant Monitoring

Land O' Lakes evaluated 36 new grant proposals and among them, 25 organizations were selected to be visited to assess their financial and technical capacity. Land O' Lakes visited 19 organizations in the month of December 2013 and the remaining will be visited in January 2014.

The following organizations were visited:

Organization	District
Cooperative des Eleveurs de Kayenzi (COOPEKA)	Kamonyi
Cooperative Uruhimbi Rwizihiye Rukoma	Kamonyi
Cooperative Amizero y'Aborozi	Kamonyi
Giramata Mworozi Cooperative	Nyanza
Alexis Business Ltd	Nyanza
Ngoma Farmers' Cooperative	Huye
Koperative Gwizumukamo Busoro	Nyanza
Zirakamwa Meza Nyanza Dairy	Nyanza
Turengere Aborozi Buhanda (KOTUA)	Ruhango
Koperative y'Aborozi Mamba Zirakamwa (KOAMAZI)	Gisagara
Koperative Urugero Rwiza/ Ndora	Gisagara
Urwuri Rwiza Ltd	Rwamagana
Koperative y'Aborozi ba Ndego (COABONDE)	Kayonza
Kiziguro Dairy Cooperative (KDC)	Gatsibo
Abarwanashyaka Milk Sypply	Nyagatare
Rwimbogo Dairy Cooperative	Gatsibo
KIBONDO DAIRY FARMERS	Gatsibo
Ingabo Dairy Company Ltd	Nyabihu
Gishwati Farm	Nyabihu

After conducting grant assessment to all 25 organizations in the next quarter, Land O' Lakes will select the best applicants to receive grant. Land O' Lakes will then send to USAID their subaward approval request.

Land O' Lakes conducted sites visit to the existing subgrantees to monitor activity progress in terms of increasing milk volume, environmental compliance, improving milk quality, and market linkages. Examples of the monitoring activities are:

- Gasabo Zirakamwa Cooperative had encountered some internal problems and had stopped receiving milk in their milk collection center. RDCP II worked closely with Gasabo district officials and the cooperative to help them to start working again. As of December 2013 Gasabo Zirakamwa was collecting 1,200 – 1,600 liter per day. RDCP II trained Coopag farmers and transporters in the milk handling and milk quality. As a result, Coopag, who was not collecting milk at the beginning of quarter one, collected 15,000 liters in the month of December 2013. In addition RDCP II worked with LISP to install the equipment which had previously been dormant.

Annexes

Annex I: FTF MS Table

Annex II: Success Story: Angeana Fresh Dairy LTD

Annex III: Global HealthShare (GHS) Clinical Microbiology Training Workbook

Annex I. FTF MS Table

Indicator / Disaggregation	Baseline Value	2012				2013							2014			2015
		Target		Actual Results		Target		Actual Results				Cumulative Achievement	Target	Actual Results	Cumulative Achievement	Target
		PPR	Updated	PPR	Updated	PPR	Updated	Quarter 1	Quarter 2	Quarter 3	Quarter 4			Quarter 1		PPR
4.5(2): Number of jobs attributed to FTF implementation	**0**	**500**		**0**		**1,000**		**0**	**0**	**31**	**299**	**330**	**1,500**	**440**	**440**	**2,000**
Location						1,000							1,500			2,000
Urban	0					400							600			800
Rural	0					600				31	299	330	900	440	440	1,200
Disaggregates Not Available																
New/Continuing						1,000				31	330	330	**1,500**	**440**	**440**	**2,000**
New	0					1,000				31	299	299	500	110	110	500
Continuing											31	31	1,000	330	330	1,500
Disaggregates Not Available																
Sex of job-holder						1,000				31	299	330	**1,500**	**440**	**440**	**2,000**
Male	0					500				7	293	300	750	391	391	1,000
Female	0					500				24	6	30	750	49	49	1,000
Disaggregates Not Available																
4.5(10): Total increase in installed storage capacity (m3)	**0**	**10**		**0**		**20**		**0**	**0**	**12.50**	**0**	**12.50**	**40**	**14.5**	**27**	**50**
Dry storage																
Cold storage	0					20				12.50	0	12.50	40	14.5	27	50
Disaggregates Not Available																
4.5.2(5): Number of farmers and others who have applied improved technologies or management practices as a result of USG assistance	**0**	**2000**		**0**		**4,000**		**0**	**0**	**1,802**	**2,985**	**4,787**	**8,000**	**5,345**	**5,345**	**12,000**
New/Continuing						4,000				1,802	4,787	4,787	**8,000**	**5,345**	**5,345**	**12,000**
New						4,000					2,985	2,985	2,000	558	558	4,000
Continuing										1,802	1,802	1,802	6,000	4,787	4,787	8,000
Disaggregates Not Available	0															
Sex																
Male	0					2,000				1,224	1,910	3,134	4,000	3,558	3,558	6,000
Female	0					2,000				578	1,075	1,653	4,000	1,787	1,787	6,000
Disaggregates Not Available	0															
4.5.2(7): Number of individuals who have received USG supported short-term agricultural sector productivity or food security training	**0**	**3000**		**0**		**4,500**		**607**	**3,002**	**1,383**	**3,525**	**8,517**	**10,000**	**2,970**	**11,487**	**15,000**
Type of individual						**4,500**		**607**	**3,002**	**1,383**	**3,525**	**8,517**	**10,000**	**2,970**	**11,487**	15,000
Producers	0							607	2,951	1,257	3,459	8,274	8,900	2,845	11,119	13,350
People in government									40	34	0	74		0	74	

People in private sector firms	0								11	91	66	168	1,100	125	293	1,650
People in civil society										1		1		0	1	
Disaggregates Not Available														0	0	
Sex						**4,500**		**607**	**3,002**	**1,383**	**3,525**	**8,517**	**10,000**	**2,970**	**11,487**	**15,000**
Male	0					2,250		451	1,969	963	2,191	5,574	5,000	2,003	7,577	7,500
Female	0					2,250		156	1,033	420	1,334	2,943	5,000	967	3,910	7,500
Disaggregates Not Available																
4.5.2(13): Number of rural households benefiting directly from USG interventions	**0**	**2500**		**0**		**5,000**		**607**	**3,593**	**4,976**	**8,501**	**8,501**	**10,000**	**11,471**	**11,471**	**15,000**
New/Continuing						**5,000**		**607**	**3,593**	**4,976**	**8,501**		**10,000**	**11,471**	**11,471**	
New	0					5,000		607	2,986	1,383	3,525	3,525	5,000	2,970	2,970	7,500
Continuing									607	3,593	4,976	4,976	5,000	8,501	8,501	7,500
Disaggregates Not Available																
Gendered Household Type	0					5,000		**607**	**3,593**	**4,976**	**8,501**	**8,501**	**10,000**	**11,471**	**11,471**	**15,000**
Adult Female no Adult Male (FNM)	0					2,300		140	654	796	1,612	1,612	4,600	1,846	1,846	6,000
Adult Male no Adult Female (MNF)	0					200		42	405	456	557	557	400	597	597	500
Male and Female Adults (M&F)	0					2,500		425	2,443	3,633	6,150	6,150	5,000	8,846	8,846	8,500
Child No Adults (CNA)									91	91	182	182		182	182	
Disaggregates Not Available															0	
4.5.2(14): Number of vulnerable households benefiting directly from USG interventions	**0**	**1,000**		**0**		**2,000**		**197**	**1,165**	**1,739**	**3,875**	**3,875**	**2,800**	**4,638**	**4,638**	**3,920**
New/Continuing	0							**197**	**1,165**	**1,739**	**3,875**	**3,875**	**2,800**	**4,638**	**4,638**	**3,920**
New	0					2,000		197	968	574	2,136	2,136	800	763	763	1,120
Continuing									197	1,165	1,739	1,739	2,000	3,875	3,875	2,800
Disaggregates Not Available																
Gendered Household Type	0					**2,000**		**197**	**1165**	**1739**	**3875**	**3,875**	**2,800**	**763**	**4,638**	**3,920**
Adult Female no Adult Male (FNM)	0					920		68	683	825	1365	1,365	1,840	234	1,599	1,640
Adult Male no Adult Female (MNF)	0					80		5	0	34	86	86	160	40	126	320
Male and Female Adults (M&F)	0					1,000		119	455	853	2342	2,342	1,400	489	2,831	1,960
Child No Adults (CNA)								5	27	27	82	82		0	82	
Disaggregates Not Available															0	

Annex I. FTF MS Table

4.5.2(23): Value of incremental sales (collected at farm-level) attributed to FTF implementation	759.26	**0**		**151.85**		**151.85**		**0**	**0**	**0**	**(202.56)**	**(202.56)**	**227.77**		**(202.56)**	**303.70**
FTF 4.5-4 : Gross margin per dairy cow	223.05	**0**		**0**		**267.66**		**0**	**0**	**0**	**189.04**	**189.04**	**289.96**		**189.04**	**312.27**
4.5.2(27): Number of members of producer organizations and community based organizations receiving USG assistance	0	4,000		0		**8,000**		**607**	**2,951**	**1,258**	**3,459**	**8,275**	**12,000**	**2,845**	**11,120**	14,000
Type of organization																
Producer organization	0					7,500		607	2,951	1,257	3,459	8,274	11,250	2,845	11,119	13,125
Non-producer-organization CBO	0					500				1	0	1	750	0	1	1,875
Disaggregates Not Available										0	0	0	0	0	0	
Sex	0					**8,000**		**607**	**2,951**	**1,258**	**3,459**	**8,275**	**12,000**	**2,845**	**11,120**	**14,000**
Male	0					4,000		451	1,934	912	2,150	5,447	6,000	1,904	7,351	7,000
Female	0					4,000		156	1,017	346	1,309	2,828	6,000	941	3,769	7,000
Disaggregates Not Available																
4.5.2(28): Number of private enterprises (for profit), producers organizations, water users associations, women's groups, trade and business associations, and community-based organizations (CBOs) that applied new technologies or management practicies as a result of USG assistance	**0**	**100**		**0**		**250**		**1**	**128**	**165**	**228**	**228**	**400**	**341**	**341**	**500**
Type of organization	0					250										500
Private enterprises (for profit)	0					150			6	7	62	75	240	188	188	300
Producers organizations	0					85		1	23	29	1	54	135	54	54	170
Water users associations												0		0	0	
Women's groups												0		0	0	
Trade and business associations	0					7			98	1	0	99	12	99	99	15
Community-based organizations (CBOs)	0					8					0	0	13	0	0	16
Disaggregates Not Available											0	0	0	0	0	
New/Continuing	0					**250**		**1**	**128**	**165**	**228**	**228**	**400**	**341**	**341**	**500**
New	0					250		1	127	37	63	63	150	113	113	100
Continuing									1	128	165	165	250	228	228	400
Disaggregates Not Available																

Annex I. FTF MS Table

4.5.2(29): Value of Agricultural and Rural Loans	**0**	**100,000**		**0**		**200,000**		**0**	**0**	**0**	**29,851**	**29,851**	**$ 300,000**	**$ 43,438**	**$ 73,289**	**200,000**
Type of loan recipient																
Producers	0					20,000						0	30,000	$ 14,725	$ 14,725	20,000
Local traders / assemblers	0					60,000						0	90,000	$ 24,296	$ 24,296	60,000
Wholesalers/processors	0					60,000					29,851	29,851	90,000	$ 4,417	$ 34,268	60,000
Others	0					60,000						0	90,000			60,000
Disaggregates Not Available																
Sex of recipient																
Male	0					30,000							45,000			30,000
Female	0					30,000							45,000			30,000
Joint	0					100,000							150,000			100,000
n/a						40,000							60,000			40,000
Disaggregates Not Available																
4.5.2(36): Value of exports of targeted agricultural commodities as a result of USG assistance (for bilateral missions)	**85,979**	**0**		**0**		**$ 94,577**		**0**	**0**	**0**	**$ 7,096,830**	**$ 7,096,830**	**$ 103,175**	**$ -**	**7,096,830**	**120371**
4.5.2(37): Number of MSMEs, including farmers, receiving business development services from USG assisted sources	**0**	**100**		**112**		**500**		**1**	**120**	**90**	**970**	**1,293**	**1,000**	**429**	**1,722**	**1,000**
Size of MSME																
Micro	0			104		450			76	68	968	1,216	270	424	1,640	180
Small	0			8		25		1	37	21	2	69	15	5	74	10
Medium	0					25			7	1		8	15	0	8	10
Disaggregates Not Available								0	0	0	0	0	0	0	0	
MSME Type																
Agricultural producer	0			38		50		1	88	25	965	1,117	30	316	1,433	20
Input supplier	0			5		200			5	4	1	15	120	0	15	80
Trader	0			55		200			7	39	2	103	120	108	211	80
Output processors	0			2		50			2	20	2	26	30	5	31	20
Non agriculture				12					18	2		32		0	32	
Other														0	0	
Disaggregates Not Available																
Sex of owner																
Male	0			31		233			49	33	635	748	140	329	1,077	93
Female	0			17		217			24	23	326	390	130	100	490	87
Joint	0					50						0	30		0	20
n/a				64				1	47	34	9	155			155	

Annex I. FTF MS Table

Disaggregates Not Available																
FTF Indicator 4.5.2-38: Value of new private sector investment in the dairy sector or food chain leveraged by FTF Implementation	**0**	**$1,000,000**		**$0**		**$4,000,000**		**$0**	**$0**	**$185,312**	**$543,284**	**$728,596**	**$5,000,000**	**$309,841**	**1,038,437**	**$5,000,000**
4.5.1(24): Numbers of Policies/Regulations/Administrative Procedures in each of the following stages of development as a result of USG assistance in each case: (Stage 1/2/3/4/5)	**0**	**1**		**1**		**1**		**1**	**2**	**0**	**0**	**3**	**2**	**1**	**4**	**2**
Sector	0												2			2
Inputs	0							0	0	0		0	1			1
Outputs								0	0	0		0				
Macroeconomic								0	0	0		0				
Agricultural sector-wide	0			1		1		1	2	0	0	3		1	4	
Research, extension, information, and other public service	0								0	0	0	0	1			
Food security/vulnerable									0	0	0	0				
Climate change adaptation or natural resource management (NRM) (ag-related)									0	0	0	0				
Disaggregates Not Available									0	0	0	0				1
Stages of development	0					1			0	0	0	0	2			2
Stage 1 of 5 Number of policies / regulations / adminitstrative procedures analyzed	0			1					2	0	0	2			**2**	
Stage 2 of 5 Number of policies / regulations / adminitstrative procedures drafted and presented for public/stakeholder consultation	0							1	0	0	0	1	2	1	**2**	
Stage 3 of 5 Number of policies / regulations / adminitstrative procedures presented for legislation/decree									0	0	0				**0**	2

Annex I. FTF MS Table

Stage 4 of 5 Number of policies / regulations / adminitstrative procedures prepared with USG assistance passed/approved									0	0	0				**0**	
Stage 5 of 5 Number of policies / regulations / adminitstrative procedures passed for which implementation has begun	0					1			0	0	0				**0**	
Disaggregates Not Available										0	0				**0**	
Indicator / Disaggregation	Baseline Value	**2012**				**2013**							**2014**			2015
		Target		**Actual Results**		**Target**		**Actual Results**				**Cumulative Achievement**	**ANNUAL TARGETS**	**Actual Results**	**Cumulative Achievement**	Target
		PPR	Updated	PPR	Updated	PPR	Updated	**Quarter 1**	**Quarter 2**	**Quarter 3**	**Quarter 4**			**Quarter 1**		PPR
Custom Indictor 1 a : Volume of milk marketed by Milk Collection Centers (in Liters)	**16,067,127**					**19,280,553**		0	0	9,340,582	15,873,227	**25,213,808**	**20,887,266**	**4,703,988**	**29,917,796**	**22,493,978**
Custom Indictor 1.1.1 a: Value of inputs and services used by members of targeted cooperatives (USD)	**231.63**					**324.28**		**0**	**0**	0	227.78	227.78	**370.60**			**393.77**
Custom Indictor (a): Change in net dairy income among targeted households(in USD)	**526.31**					**105.26**		**0**	**0**	0	(197.39)	(197.39)	**157.89**			**210.52**
Custom Indictor 1.2 a: Number of new milk quality assessment technologies\protocols adapted\implemented	0					**2**		0	0	5	0	5	**2**	**0**	**5**	**3**
Custom Indictor 1.3 a: Number of new products awarded RSOQ	0					**5**		0	0	0	0	0	**8**	**0**	**0**	**8**
Custom Indictor 1.3 b: Percentage of milk marketed under RSOQ	0					**10%**				0	0	0	**15%**		**0**	**20%**
Custom Indictor 2.1 a: Number of dairy related firms and organizations newly aligned within and provided a voice by dairy sector affinity organizations	0					**70**		0	0	12	0	**12**	**70**	**4**	**16**	**70**
Custom Indictor 2.2 a : Number of dairy enterprises with upgraded production facilities resulting from successful financing applications						**500**		0	0	0	1	**1**	**500**	**15**	**16**	**600**

Annex I. FTF MS Table

Custom Indictor 2.2 b : Liters of additional daily milk processing resulting from financing assisted by RDCP II	0					**10,000**		0	0	0	0	**0**	**20,000**		**0**	**30,000**
GNDR-2 : Proportion of female participants in USG-assisted programs designed to increase access to productive economic resources (assets, credit, income or employment)	0					**50%**		0	35%	27%	38%	38%	**50%**	**32%**	**35%**	**50%**
GNDR-3 : Proportion of females who report increased self-efficacy at the conclusion of USG supported training/programming	0					**60%**		0	0	78%	78%	78%	**70%**		**78%**	**80%**
GNDR-4 : Proportion of target population reporting increased agreement with the concept that males and females should have equal access to social, economic, and political opportunities	0					**70%**		0	0	85%	85%	85%	**75%**		**85%**	**80%**

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SNAPSHOT

Angeana Fresh Dairy LTD: Equipped and linked to a lucrative market

Better Equipped Cooperatives, More Milk and Higher Quality Dairy Products

Photo: Emmanuel Nsekanabo/Land O'Lakes International Development

The photo above features the Vice President of Land O'Lakes International Development Jonathan Halverson and RDCP II Chief of Party Frank O'Brien together with AIKIB Cooperative and Angeana representatives during the handover ceremony of a Mobile Insulated Tank and a Cooling Tank in Gicumbi District, North of Rwanda.

"Since Inyange Industries gave us a contract to supply milk, we have increased our collection efforts by extending to other parts of the country so that we maintain our old retail chain. This means more business to us,"

Mr. Milton Ngirente,

Angeana founder

Telling Our Story
U.S. Agency for International Development
Washington, DC 20523-1000
http://stories.usaid.gov

Following a series of negotiations with the country's largest dairy processing plant, Inyange Industries Ltd., the Rwanda Dairy Competitiveness Program II has managed to establish a strong market linkage between one of the country's largest processors and a bulk milk collector, Angeana Fresh Dairy Ltd. This partnership is expected to benefit 4,400 farmers based in northern Rwanda's hilly districts of Gicumbi and Rulindo, which border the Republic of Uganda.

Through the USAID-funded program, which is being implemented by Land O'Lakes International Development, RDCP II brokered a lucrative deal that will enable Angeana to supply 20,000 liters of milk to Inyange every day. Previously, without a dedicated buyer, Angeana had to distribute to 50 small scale suppliers across Rwandan capital, Kigali. This resulted in high logistics and distribution costs and lower payouts to farmers.

To Angeana and the farmer-members within the dairy cooperatives who provide the raw milk, this contract came as a huge relief because of two essential outcomes: the availability of a bigger market and a lower-cost operation in transportation and logistics.

According to the founder and Managing Director Mr. Milton Ngirente, the contract facilitated by RDCP II has enabled him to save US $920 each day, which translates into a savings of $27,600 a month and $331,200 each year. By enabling this critical market linkage, Angeana earns $7,400 each day through just one transaction.

"Having a ready market has encouraged me to double my efforts to collect more milk from the various cooperatives that are linked with farmers deeper in remote areas," Mr. Ngirente noted.

The advantages of facilitating this type of market linkage are multi-pronged, as they benefit the entire value chain – including farmers, cooperatives, transporters, bulk milk collectors and the processor itself. In addition, Inyange Industries is relieved of the burden of allocating resources, energy and time to collect milk from this part of the country.

“Since Inyange Industries gave us a contract to supply milk, we have increased our collection efforts by extending to other parts of the country so that we maintain our old retail chain. This means more business to us,” Mr. Ngirente added.

In addition, USAID’s support of RDCP II has enabled Land O’Lakes to help strengthen and build the capacity of Angeana to collect and transport higher volumes of milk. The program granted the small scale firm an 8,000-liter insulated mobile tank worth US $30,000, which was provided at the end of November 2013. The large mobile tank has enabled Angeana’s milk collection volumes to surge from 15,000 liters to 20,000 liters a day as a result of this equipment and market linkage.

Grant funds should kick-start agricultural investments, and Angeana seems to have realized the potential of this collaboration. The firm is already contemplating further investments for the future. “We are now in a position to purchase a 12,000-liter mobile insulated tank and another truck so that we can explore additional opportunities that dairy sector can offer,” Mr. Milton said.

The Global HealthShare® (GHS)
Clinical Microbiology Training Workbook: Rwanda Dairy Competitiveness Program II

Prepared by
Global HealthShare® initiative
University of California, Davis
Davis, California

In collaboration with….

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LAND O LAKES INTERNATIONAL DEVELOPMENT
Innovative Solutions for Global Prosperity

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Acknowledgement

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This workbook was created to supplement the Milk Microbiology Training Program held at UC Davis, made possible through the contributions from USAID and Land O'Lakes' International Development Division's Rwanda Dairy Competitiveness Program II (RDCP II).

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Welcome to the Clinical Microbiology Training Program

This workbook is meant to train basic clinical microbiologists, dairy production faculty, and veterinary students dedicated to learning the fundamentals of dairy food safety. Here, we propose a clinical microbiology participatory surveillance study particularly designed for the identification of mastitis. This customized two week training program will encompass lectures on data recording, data management, reports to veterinarians, identification and reporting of known and unknown microbes, and finally development of protocols to set up the surveillance and effective management of mastitis. The overarching goal is to scale up the "train the trainer" process to benefit a large number of smallholders through proper identification and management of mastitis.

Determining the presence and identity of harmful pathogens in milk is a critical step towards improving the health of a cow and increasing the supply of safe, quality milk in response to growing demand for milk. This workbook will guide you through the basics of bovine specific milk microbiology including: (a) supplies and equipment needed for work--- space setup, (b) accurate record keeping, (c) culturing techniques, (d) pathogen identification and differential assays for both individual samples and bulk tanks, and (e) waste management. In addition, the manual provides many simple ways to streamline an efficient laboratory operation to save time and resources. The appendix in the back of the book contains several blank pages for notes as well as a valuable "Flashcard" section to be utilized when quick reference for bacterial and yeast profiles, gross morphologies, and properties are needed.

Additional References:

Clinical Veterinary Microbiology, 2nd Edition by Bryan Markey, Finola Leonard, Marie Archambault, Ann Cullinane, Dores Maguire (Mosby/Elsevier Health Sciences)

Laboratory Techniques for Veterinary Technicians by Charles Mackey Hendrix, MargiSirois (Mosby/Elsevier Health Sciences)

Agenda

DAY	ACTIVITY
DAY 1 (Monday)	**9:00 – 10:00 AM** – Introduction and overview of Project Strategy, Orientation to the project **10:00 – 10:45 AM** --- Microbiology Component --- Lab tour and familiarize with researchers, equipment, chemical, and plate preparation **10:30 – 10:45 --- Break** **10:45 – 11:45 AM** – Good Record Keeping & discussion **11:45 – 1:30 PM** --- Lunch **1:30 – 2:30 PM** --- Review basic lab safety training **2:30 – 3:15 PM** --- Clinical microbiology methods – Part I **3:15 --- 3:30 PM** --- Break
Day 2 (Tuesday)	**9:00 – 10:00 AM** --- **Demonstration**: Clinical microbiology process – plating sample (guided) **10:00 – 10:45 AM** --- **Demonstration**: California Mas++s Test and Good laboratory practices **10:30 – 10:45 AM** --- Break **10:45 – 11:45 AM** – Clinical microbiology methods – Part II, Bench tests/differential characteristics of bacteria **11:45 – 1:30 PM** --- Lunch **1:30 – 2:30 PM** --- Basic milk bacteriological identification flow chart **2:30 – 3:15 PM** --- Clinical microbiology methods – Part II **3:15 --- 3:30 PM** --- Break **3:30 – 4:30 PM** --- Dynamic Dairy Management Component – an overview – Part I
Day 3 (Wednesday)	**9:00 – 10:00 AM** --- **Practice**: Continue processing samples for practice (guided); record keeping and reading samples (hands on) **10:00 – 10:45 AM** --- **Demonstration**: Good record keeping practices **10:30 – 10:45 AM** --- Break **10:45 – 11:45 AM** – **Discussion**: Creating protocols and streamlining laboratory management **11:45 – 1:30 PM** --- Lunch **1:30 – 2:30 PM – Discussion:** Basic milk bacteriological identification flow chart **2:30 – 3:15 PM** --- Dynamic Dairy Management Component – an overview – Part II **3:15 --- 3:30 PM** --- Break **3:30 – 4:30 PM – Discussion:** Effective communications for international projects and value of TEAM (Together We Achieve More) work

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DAY	ACTIVITY
Day 4 (Thursday)	**9:00 – 10:00 AM** --- **Practice**: Continue processing samples for practice (unguided) and record keeping and reading samples (hands on) **10:00 – 10:45 AM** --- **Demonstration**: Reading samples (hands on)practices **10:30 – 10:45 AM** --- Break **10:45 – 11:45 AM** – **Discussion**: Group presentations – group of 4---trainees will develop a presentation to give on the day 11 detailing implementation upon return to Rwanda **11:45 – 1:30 PM** --- Lunch **1:30 – 2:30 PM – Discussion:** Methods to engage smallholders and provide sustainable extension service **2:30 – 3:15 PM** --- Dynamic Dairy Management Component – an overview – Part III **3:15 --- 3:30 PM** --- Break **3:30 – 4:30 PM –** Introduce basics of effective videoconferencing and Skype
Day 5 (Friday)	**9:00 – 10:00 AM** --- **Practice**: Continue processing samples for practice (un---guided) – 4 day plating only; plate reading; record keeping **10:00 – 10:45 AM** --- **Demonstration**: Good practices: generating, recording, management and transferring data **10:30 – 10:45 AM** --- Break **10:45 – 11:45 AM** – **Discussion**: How to set up a new microbiology laboratory and basic requirements **11:45 – 1:30 PM** --- Lunch **1:30 – 2:30 PM –** Waste disposal and basic regulatory and food safety **2:30 --- 2:45 PM** --- Break **2:45 – 3:45 PM –** 4Ps of Marketing **3:45 – 4:30 PM** – Discussion and feedback on 4Ps of Marketing
Day 6 (Saturday)	***9 AM – 9 PM ------ Sightseeing and team building***
Day 7 (Sunday)	*Break – Time for work on group presentation*
Day 8 (Monday)	**7:30 AM – 7:30 PM** --- University Dairy Teaching and Research Facility and visiting local farms

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DAY	ACTIVITY
Day 9 (Tuesday)	**9:00 – 11:00 AM** --- **Practice**: Individual unguided sample processing incl. mastitis identification, plate reading, bench tests, differential characteristics of bacteria; bacteriological identification – Sample Set A **11:00 – 1PM** – Lunch **1:30 – 2:30 PM –** Global HealthShare and Power of Sharing **2:30 --- 2:45 PM** --- Break **2:45 – 3:45 PM – "**Pricing" for Mastitis Control **3:45 – 4:30 PM --- Field trip**: UC Davis on campus Dairy Facility
Day 10 (Wednesday)	**9:00 – 11:00 AM** – **Data collection and Practice for next steps**: Individual unguided sample processing incl. mastitis identification, plate reading, bench tests, differential characteristics of bacteria; bacteriological identification – Sample Set A **11:00 – 1PM** – Lunch **1:30 – 3:30 PM** – Discussion and feedback on 4Ps of Marketing **3:30 --- 3:45 PM** --- Break **3:45 – 4:30 PM – Field trip**
Day 11 (Thursday)	**9:00 – 11:00 AM** – Practical results – Sample Set A **11:00 – 1PM** – Lunch **1:30 – 3:30 PM** – Project mentoring session/discussion on group presentation/survey form distribution **3:30 --- 3:45 PM** --- Break **3:45 – 4:30 PM – Field trip**
Day 12 (Friday)	**9:00 – 11:00 AM – Group presentation** **11:00 – 1PM** – Lunch **1:30 – 2:30 PM** – Discussion on Training evaluation (survey) **2:30 – 3:30 PM** --- **Wrap---up/Next Steps** (Take home message) **3:30 – 5:30** --- Break **5:30 – 7:30 – TEAM Dinner**

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Day 1

Introduction

Overview of Project Strategy

Orientation to the project

Lab tour and familiarize with researchers, equipment, chemical, and plate preparation

Lecture:
I. Clinical microbiology methods – Part I

II. Good Record Keeping

III. Review basic lab safety training.

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Good Record Keeping Practices

The importance of good record keeping cannot be overstressed. Proper records should be care--- fully maintained, easily legible to the reader, and signed off with proper authorization, such as a veterinarian or faculty member, when appropriate. Remember that since the findings of milk testing may directly affect the treatment of the cow -- such as the specific antibiotics it will receive -- it is important to report accurate results. In some cases a farmer may need to cull a cow to protect the health of his herd, therefore it is important to stay on the safe side and retest and recheck to ensure there were no mistakes made either during testing or in the data records.

You will be working alongside the Dairy Dynamic Management team who will collect milk samples from fifty cows each week. The DDM team will collect animal health data in the field, and microbiology results will be added to complete the data set. First, animal health and microbiology data will help serve as the comparative basis to determine if discrepancies exist between field data and laboratory data. Next, the data will drive discussion of interventions needed to resolve animal health issues. And finally, the data will track trends week by week. The following form outlines the information that will be collected each week--- it is an example of an animal health spreadsheet and it is also included in the Dropbox.

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Notes:

Turn the page to Hind an example of an animal health and microbiology spreadsheet you will use throughout the duration of the project.

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Mastitis Control/Animal Health [proposed spreadsheet v1.0]				
JS Cullor, M Doyle, S Nandi				
Animal ID	**Week 1**	**Week 2**	**Week 3**	**Week 4**
	[Date]	**[Date]**	**[Date]**	**[Date]**
	[Time]	**[Time]**	**[Time]**	**[Time]**
Days in Milk (DIM)				
Milking schedule				
1 time/day				
2 times/day				
Milk output (liters/milking)				
CMT score				
Left front (LF)				
Left rear (LR)				
Right front (RF)				
Right rear (RR)				
Rectal Temp (C)				
Heart Rate (BPM)				
Lameness				
Yes				
No				
Type of ration				
Forage				
Forage/grain				

Cont.

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Appetite				
Good				
Poor				
Feces				
Normal				
Loose				
Milking equipment cleanliness				
Clean and sanitized				
Not clean				
Mircobiology results:				
General remarks:				
Evaluator Name:				
Veterinarian Signature:				
Faculty Member Signature:				

Veterinarian and faculty member must sign off on data collected each week

Scoring Milk Appearance

- The milk appearance scores are listed below:

  N= Normal milk C= Colostrum S= Serum W= watery

  B= Bloody T= Thick

  M/G= Garget, <lakes, etc.

- Quarter samples indicated A,B,C,D and blind quarters usually indicated with an X.

  F= Fresh

  H= Heifer

  C=Clinical

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Basic Safety Guidelines

1. Know the location of all exits for the laboratory and the building. Each exit in the building will have a lighted exit sign.

2. Know the location and use of the safety showers, eyewashes, and first aid kits.

3. Know where the fire extinguishers and alarm pull boxes are located and how they operate.

4. Know the potential hazards of the materials, facilities, and equipment with which you will work.

5. Use the proper safety equipment for your procedure. This could include a fume hood, glove box, biosafety cabinet, shields, or other equipment.

6. Wear eye protection in the laboratory. Splash goggles are required for wet chemical work or work with corrosive dusts and powders.

7. Wear personal protective gear when required by laboratory or experimental conditions. This could include laboratory aprons, laboratory coats, gloves, etc. Wear clothes that protect the body against spills, dropped objects, and other accidental chemical contact. Open shoes, sandals, bare feet, bare midriffs, and bare shoulders are prohibited.

8. Long hair should be tied back or otherwise confined. Secure ties or other articles of clothing or jewelry that might become entangled in equipment.

9. Eating, drinking, gum chewing, tobacco chewing, or application of cosmetics are prohibited where biological hazards, radioactive materials, or chemicals will be stored or used. Food must not be kept in refrigerators or cold rooms with chemicals or other hazardous materials.

10. Wash hands carefully before leaving the laboratory. Beware of contamination on clothing, doorknobs, doorframes, etc.

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11. Follow written protocols or instructions. Perform only authorized experiments. Do not create shortcuts to procedures. Be alert for unsafe conditions. Inspect often; take effective corrective action promptly. Do not leave equipment or reactions operating while unattended and do not horseplay in the laboratory.

12. Follow good housekeeping practices clean up as you go and keep work areas and exits uncluttered. Maintain clear accessibility to eyewash/emergency showers, fire extinguishers, and electrical panels.

13. Perform only authorized experiments and be sure you understand the procedures involved before you begin to prevent anything unexpected or dangerous from accidentally occurring.

14. Assume responsibility for visitors and require that they follow the same safety procedures as other laboratory workers.

For further safety guidelines approved by UC Davis visit:
http://safetyservices.ucdavis.edu/ps/cls/clsm/generalSafetyRules

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Basic equipment, chemicals, and disposables for mastitis participatory Study

Equipment

- Laminar <low chamber/sterile inoculation chamber
- 37°C Incubator (for 100 plates)
- Sealed glass jar for CO2 incubation
- Dissecting microscope
- Bunsen burners or alcohol/spirit lamps
- Regular fridge (4°C) and -20°C freezer
- Autoclave
- Continuous, 24/7 reliable power for equipment with backup
- Broadband connectivity for DDM and weekly update video conferencing

Chemicals

- 3% KOH (potassium hydroxide)
- 3% H2O2 (hydrogen peroxide)
- Plasma (animal) for coagulase test
- Latex (Immcell) can also be used for the coagulase test
- California Mastitis Test solution
- Beta---toxin
- Gram stain solution

Disposables

- Bovine washed blood cell agar plates (pre-made)
- Mycoplasma plates and JD mycoplasma broth (pre-made)
- Jar or packs of sterile cotton tip swabs (Q-tips)
- Tungsten loops, (2/4mm, 3 in): platinum loop, (0.01 ml)
- Glass slides
- Coverslips
- Parafilm
- Erlenmeyer flasks
- Autoclave tape
- California Mastitis Test (CMT) paddles
- Cotton swabs
- Marking pens
- Test tubes and test tube racks
- Syringes, needles, etc.
- Powder free gloves
- Other miscellaneous basic lab items

Day 2

Demonstration: Clinical microbiology process – plating sample (guided).

Demonstration: California Mastitis Test and Good laboratory practices

Lecture:
I. Clinical microbiology methods – Part II
Bench tests/differential characteristics of bacteria

II. Basic milk bacteriological identification <low chart

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Notes:

Sterilization is key for a successful plate--- multiple bacterial colonies can disrupt results and provide incorrect findings.

General Description for Preparing Agar Plates

NOTE: You will need to wear gloves throughout the duration of this procedure to prevent bacteria from your hands contaminating the plates and for your own safety. DO NOT BREATHE ON THE PLATES OR MEDIUM.

The petri dishes are pre-sanitized and no further sanitization is needed depending on what you purchase. If the Petri dishes should be enclosed in the original packaging, leave them until ready to use. For 1000 milliliters (ml) of agar mixture, you can fill 50, 9 cm (18-20 ml) plates.

For Microwave

1. Prepare agar powder by placing it in the microwave with the appropriate amount of water. The label should provide specific directions although about 7 grams to 500 ml of water is standard.

Treat bottled agar formula carefully by loosening the bottle cap (but not removing) before placing in the microwave to warm and soften into a liquid state. Sterilize the bottle after microwaving by placing the neck of the bottle over an open flame a few times to ensure any airborne germs are eradicated before proceeding to plate making.

NOTE: Tightening the cap may cause the flask to explode. Check that you can "jiggle the cap"- it is clearly loose but does not fall off the bottle when lightly shaken.

Notes:

For Autoclave:

1. Begin by sterilizing the petri dishes. Accomplish by placing them in a bath of boiling water and dry upside down on a sanitized drying rack or lab work bench. If the Petri dishes are still enclosed in the original packaging, leave them until ready to use. For 1000 milliliters (ml) of agar mixture, you can fill 50 average-sized petri dishes.

2. Make the appropriate medium without antibiotic. Add solids and deionized water to a large bottle/flask as instructed by the product. Add BactoAgar (which will NOT melt until autoclaved) and cover it with foil and a small piece of autoclave tape. Autoclave the medium to sterilize it.

NOTE: Do NOT add the antibiotic to the medium before autoclaving or immediately after removing the agar from the auto- clave. Adding the antibiotics when the agar is too hot may degrade them.

3. After autoclaving, run cold tap water over the flask or set the flask on a cool counter while swirling the molten agar medium to cool. The antibiotic can be added to the medium when you can place your hand on the bottle/flask for an ex- tended period of time.

NOTE: Avoid cooling the agar to the point it begins to re- solidify. It should still be warm to the touch (approximately 50 degrees Celsius). Do NOT shake the bottle/flask, this could create bubbles in the agar that will be difficult to spread bacterial culture over. If a few bubbles form, use a small flame to pop them. If multiple bubbles form you may need to re-plate.

Notes:

Place the petri dishes the right way up and crack but do not remove the lids. This is to prepare them for individual handling when the other hand is holding the agar mixture in a suitable pouring vessel such as a glass pitcher.

5. Gently lift the lid of the petri dish with one hand and hover the lid immediately over the bottom dish to remove any chance of airborne germs entering.

6. Pour an amount of agar liquid into each dish as you hover the lid as mentioned in the previous step. About 1/8 inch is a standard thickness for the liquid measure. (18-20 mL or 9 cm plate)

7. Allow the agar to set into the dishes by leaving them on a flat, clean surface to dry in the natural room temperature. Stack the plates on top of each other to avoid the condensation in the lid. Secure lids once set and store upside down.

Notes:

Preparing BLOOD AGAR Plates

NOTE: Some bacteria are fastidious, meaning they are more demanding in the nutrients they require for growth. Therefore, since these bacteria will not grow on normal agar plates, one method of promoting growth of important fastidious bacteria is using a medium containing blood with clotting proteins re- moved (i.e. defibrinated blood). The variety of complex nutrients found in blood supports the growth of most bacteria, fastidious and otherwise, that would be encountered in medical laboratories.

To prep the Blood Agar Base: Autoclave nutrient agar. Allow to cool to 45-50 C.

2. To sterile Blood Agar Base, add 5% (vol/vol) sterile defibrinated blood that has been warmed to room temperature

3. Swirl the flask to mix thoroughly, avoiding the formation of bubbles, and dispense into sterile plates, continuing to avoid bubbles and froth on the surface.

4. Once solidified it is ready for use.

NOTE: Cooling the agar and warming the blood are essential steps in this procedure. Hot agar can damage red blood cells, and cold blood can cause the agar to gel before pouring

Notes:

Preparing MYCOPLASMA Plates and Broth Base

Mycoplasma Agar Base:

1. Suspend 34 g of the powder in 1000 ml of purified water. Mix thoroughly. Heat with frequent agitation and boil (in microwave) for 1 minute to completely dissolve the powder.

Mycoplasma Broth Base:

1. Suspend 2 g of the powder in 100 ml of purified water. Mix thoroughly. Warm slightly to completely dissolve the powder.

2. After above: Autoclave at 121°C for 15 minutes. Cool down to 50°C and add enrichment. Recommended enrichments include addition of 20 ml of horse serum and 5 ml of specially prepared yeast extract to each 75 mL of cooled medium or use label per manufacturer's recommendation.

3. For a selective medium inhibitory to bacteria, add Mycoplasma Enrichment without antibiotic to molten agar medium (50°C) or to broth medium and then add sterile antibiotic to a final concentration of units/ml recommended. Test samples of the finished product for performance using stable, typical control cultures.

4. Rest of the procedure is as described in preparation of blood agar plates. For Mycoplasma broth about 3-5 ml of sterile liquid media can be distributed in 10 ml bacterial culture tubes and stored in fridge (4°C) for future use.

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Notes:

If the results of the bacterial plate is ambiguous re-plate! The correct distinction of the bacteria is critical to determining the health of a cow and the herd as a whole.

Arranging Plates and Broth for Milk Samples

1. Arrange samples in numerical order (this makes looking up individual sample numbers easier later) and then record them on your record or information sheet. Leave two empty spaces in the front of each row in the rack--- one to move up after plating and the other when the CMT's are done. (When all the samples are at the front of the rack you know that you are done with all the steps). The samples should be separated according to the group or strings if it is an entire herd test. If it is a smaller sampling they should be separated into a fresh and frozen group: fresh cows/heifers versus clinical samples. Identify with the owner's name, veterinary, date, string or any other identifying features you believe you should record. Record the cow #, quarter or other information if it is on the tube and the appearance of the milk. (The CMT score will be recorded after plating).

2. Remove the blood plates and mycoplasma plates from the refrigerator; then, using a marking pen, mark the agar side of the petri dish (blood plate & myco) into quarters. In the top right hand corner of the plate mark the ID/code and the date .There will be one blood plate with one mycoplasma plate. Begin coding the plates with the first sample at the top of the plate with the ID # and the date. The next sample will go below the first one, and around the plate in a clock wise motion. Mark the myco plate with the same information and stack together. Mark the next sheep plate with the next 4 samples and the mycoplasma plate starting in the right hand corner (the quarter with the ID and date) and then move in a clockwise motion. Continue until all the plates are labeled for the number of samples that you have. (Each row will have 2 blood agar and 2 myco agar plates).

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Notes:

3. The plates are upside down at this point, so you will need to carefully turn them right side up. The plates are now in the order that your samples are in their rack. Take the first set of two plates; one sheep plate and one mycoplasma plate.

4. Place the one sheep plate on the bench and the mycoplasma plate to the side of the sheep plate.

5. Remove the milk sample from the rack and shake to mix the cream/fat. Move the sample up one space in the rack.

6. Remove a sterile swab from the jar or package. DO NOT TOUCH THE SWAB TO ANYTHING THAT WILL CONTAMINATE IT, THE SAMPLE, OR THE PLATE.

7. Remove the lid from the tube and insert the swab into the tube. The swab will pate approximately .05 ml of sample on the plate. If you prefer disposable or metallic loops can be used in place of the sterile swabs. For tank samples a calibrated platinum loop can be used and delivers a 0.01 aliquot of sample to the plate.

8. Tilt the lid on the sheep plate (try to keep the plate covered as much as possible, this will help cut down on contamination) and streak the sheep plate with a back and forth motion from side to side, starting from the top of the plate and moving down to the halfway mark. Be sure to leave approximately1/4---1/2 inch from the marker line. This will make it much easier to read the plates for hemolytic patterns produced by *Staphylococcus aureus*.

9. Insert the same swab back (unless it has been contaminated) into the sample tube and plate the first sample on the mycoplasma plate. This will be the quarter in the upper left corner of the myco plate. Streak the sample and then feather the edge of the streak back where you started. The myco plate will be turned clockwise to the next sample, until all four samples are done.

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Notes:

10. After you have finished plating the blood plate and the mycoplasma plate recap the tube.

11. Move the next sample up one space for the next plating and continue moving all the samples in that row up one space. Continue plating the entire rack moving each sample up one space in that row.

12. Place the blood plates in one stack and the mycoplasma plates in another stack. Leave the plates stacked (lid up) until you are sure the samples have dried. If you turn them too soon, they will run into each other.

13. When you have finished and they are dry, turn the plates up--- side down and place them in the incubator. The sheep plates will be placed in the incubator at 37º C and the mycoplasma plates in a CO2 incubator or a closed jar with a candle (we will be using candle jars).

14. Blood plates incubate for 18 --- 24 hours @ 35º C---37º C. Mycoplasma plates incubate for 5 --- 7 days @ 35º C---37º C.

15. If the samples are unfrozen you will need to perform a California Mastitis Test (See Page XX for Instructions). The test is scored with a 0, 1, T, 2 & 3; with the 0 being a normal milk and a 3 being the most abnormal.

Note: If the samples have been frozen the CMT might not result in valid interpretations. The SCC (Somatic Cell count) is invalid for frozen samples. Although samples have been frozen a CMT may be used as an interpretation and learning to score the CMT (sample).The freezing of the samples does not seem to interfere with recovering of most bacteria from the sample. (It is felt that freezing will actually increase the recovery of *Staph aureus*).

16. The samples can now be returned to the refrigerator and saved until you are sure that you are done with them.

Notes:

17. We will do a limited number of mycoplasma broth tubes due to the cost. There will be plating demonstration for teaching purposes but not all samples will be brothed and re-streaked. After plating both plates re-insert the swab into the 3 ml tube of mycoplasma broth and break the swab off about half way. Recap the tube and move it up one space in the rack. There will be one space left in the rack for the re-plating step. Incubate broth 48 hours in the incubator @37ºC. After approximately 48 hours re--- streak the broth sample onto a new mycoplasma plate, moving each sample to the front of the rack as one plate them. Incubate 5 to 7 days in a candle jar at 37º C. Check both set of plates before calling a sample negative. This method should help eliminate the chances of missing animals that have mycoplasma but the colonies were too few in number to grow on the original streak. It appears that some mycoplasma positive animals are being missed using the standard method.

California Mastitis Test

Materials:

- California Mastitis Test (CMT) solution
- CMT paddle

PROCEDURE:

1. One milk sample per well on paddle (4 wells per paddle), add equal volume of the CMT solution to the milk while holding over sink; swirl in an even manner, watching for jelling of the milk and CMT solution while swirling. The reaction should occur within 30 seconds or less.

Scores:

0: No visible clumping.

T: A slight film will appear (very faint).

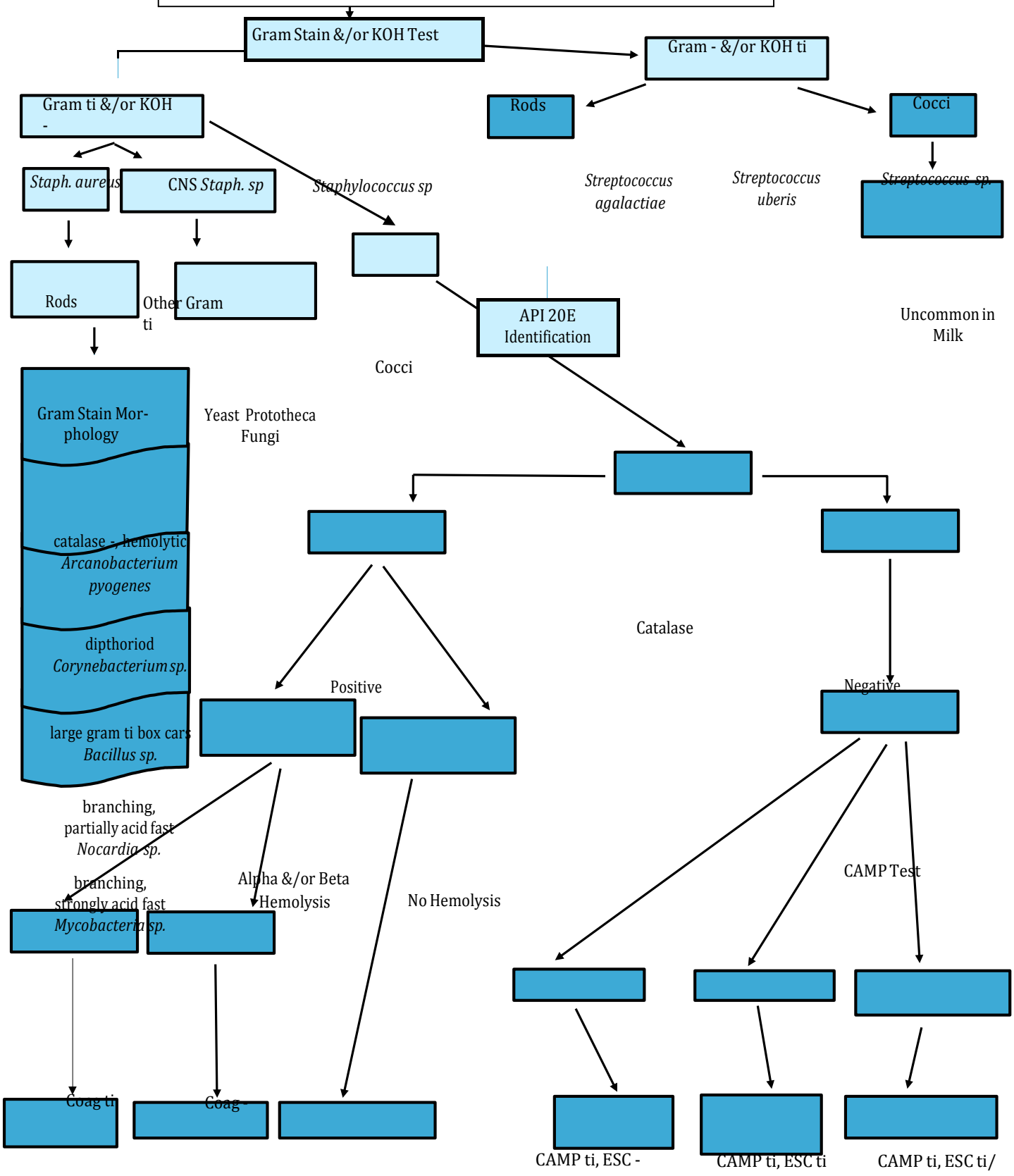
1: Sample will swirl but there will be a light film that swirls slower than the rest of the sample in the middle of the well, no visible clumping just a slight film.

2: Sample will jell towards the middle of the well, will pour in a thin line but jelled together.

3: Sample will coagulate heavily; will pour out in a clump into the sink.

Bacterialogical Identification Flow Chart

Record Colony Type & Numbers



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Day

Practice:

Processing samples (guided); record keeping
Differential Tests
Practice: reading samples (hands on)

Discussion:
Creating protocols and streamlining laboratory management

Lecture: Effective communications for international projects and value of TEAM (Together We Achieve More) work

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Gram Positive/Gram Negative

Objective: To determine if a bacteria is a gram + (positive) or a gram - (negative).

Materials needed:

1. KOH Solution
2. H_2O_2
3. Slides/Cover Slips
4. Inoculating Loop and handle
5. Bunsen Burner/Spirit Lamp
6. Ethanol

*****NOTE: Always flame your inoculating loop before and after using it!!!*****

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Notes:

PROCEDURE FOR GRAM - (NEGATIVE) BACTERIA (KOH)

1. Place one drop of the KOH solution on a clean glass slide.

2. Pick a colony or two from the plate with a sterile COOL loop and mix it into the KOH solution.

3. While stirring the solution (1 - 2 minutes) lift the suspension off the slide several times. If the suspension comes up off the slide in a string, this reaction is a gram negative bacteria.

THE BACTERIA IS KOH ti (POSITIVE): GRAM -- (NEGATIVE)

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Notes:

PROCEDURE FOR GRAM + (POSITIVE) BACTERIA (H2O2)

Catalase Test: Facilitates the detection of the enzyme catalase in bacteria essential for differentiating catalase - positive *Micrococcaceae* from catalase - negative *Streptococcaceae*.

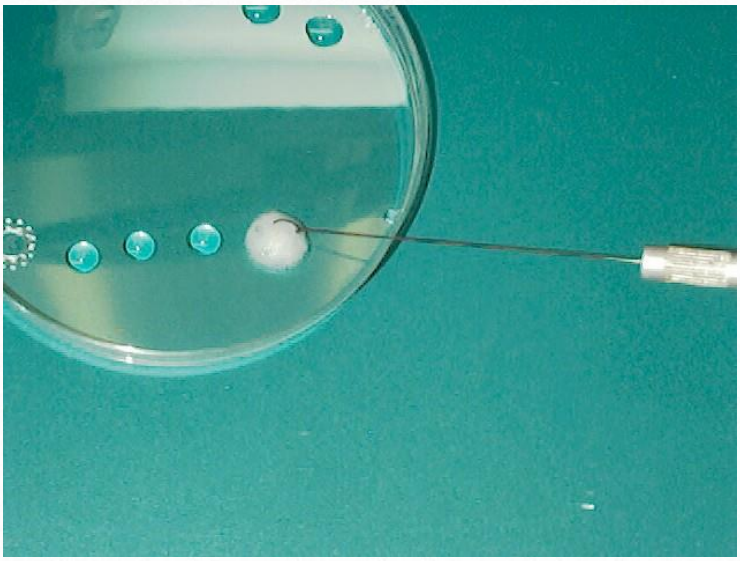
1. Using a dropper, place 1 drop of 3% H_2O_2 on a clean glass slide.

2. Use a sterile inoculating loop or STERILE wooden applicator stick to pick up several colonies and place into the H_2O_2.

Note: If using BLOOD AGAR plate, DO NOT pick up any agar. Red Blood cells may result in a false---positive reaction.

3. Positive Reaction: Immediate bubble formation. Move dish to a dark counter/place atop dark paper if bubbles are difficult to fully see.

THE BACTERIA IS H_2O_2 + (POSITIVE): GRAM + (POSITIVE)



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Additional Assays

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Notes:

Simple Gram Stain

Distinguishes between gram-positive and gram-negative bacteria utilizing differences in cell walls.

PREPARATION PROCEDURE:

1. Place a loop-full of water on a slide. Transfer colony using a cool sterile---inoculating loop onto the drop and emulsify.

2. Allow film to air dry.

3. Fix the dried film by passing it BRIEFLY through the Bunsen flame. DO NOT expose the dried film directly to the <lame and DO NOT heat the slide excessively - you should still be able to comfortably hold the slide.

STAINING PROCEDURE:

1. Flood the slide with crystal violet solution for approximately one minute (do not exceed one minute). Wash off briefly with tap water (do not exceed 5 seconds of rinsing) and drain.

2. Flood slide with Gram's Iodine solution - let sit for approximately one minute. Wash quickly with tap water. Drain.

3. Remove excess water from the slide and blot (to prevent alcohol used for decolonization from diluting.) Flood slide with 95% alcohol for 10 seconds then rinse with tap water. Drain.

4. Flood with counter stain for 45 seconds and rinse. Dry the slide with lens paper.

5. Examine under the Oil Immersion lens.

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Notes:

Consider the bacteria, CMT, and the milk appearance to determine if the presence of the bacteria are significant.

Coagulase Test

The coagulase test is used to differentiate *Staphylococcus aureus* from coagulase---negative *Staphylococci*.

S. aureus produces two forms of coagulase (i.e., bound coagulase and free coagulase). Bound coagulase, otherwise known as "clumping factor", can be detected by carrying out a slide coagulase test, and free coagulase can be detected using a tube coagulase test.

We will use the slide method.

Positive = *S. aureus*, Negative

= *Staphylococcus*.

Formations of red clumps in the solution are *S. aureus*, no visible red clumps *S. aureus* negative.

Blood Broth

S. *aureus* and *Staphylococcus*

Positive = *S. aureus*

Negative = *Staphylococcus*

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Notes:

Catalase Test

Facilitates the detection of the enzyme catalase in bacteria essential for differentiating catalase---positive *Micrococcaceae* from catalase - negative *Streptococcaceae*.

SLIDE DROP Procedure:

1. Place a microscope slide inside a petri dish.

2. Use a sterile inoculating loop/STERILE wooden applicator to stick to collect a 24 hour colony from bacteria plate.

   Note: If using BLOOD AGAR plate, DO NOT pick up any agar. Red Blood cells may result in a false---positive reaction.

3. Using a dropper, place 1 drop of 3% H_2O_2 onto the organism on the microscope slide. DO NOT MIX. Immediately cover the petri dish with lid.

4. *Positive Reaction*: Immediate bubble formation. Move dish to a dark counter/place atop dark paper if bubbles are difficult to fully see.

STAINING PROCEDURE:

1. Flood the slide with crystal violet solution for approximately one minute (do not exceed one minute). Wash off briefly with tap water (do not exceed 5 seconds of rinsing) and drain.

2. Flood slide with Gram's Iodine solution--- let sit for approximately one minute. Wash quickly with tap water. Drain.
3. Remove excess water from the slide and blot (to prevent alcohol used for decolorization from diluting). Flood slide with 95% alcohol for 10 seconds then rinse with tap water. Drain.

4. Examine under the Oil Immersion lens.

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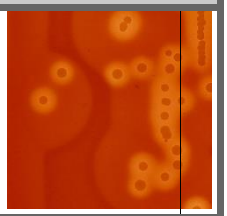
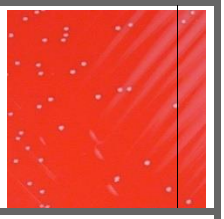
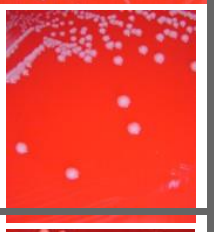
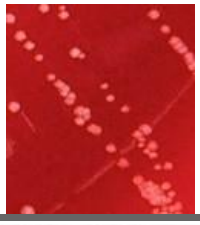
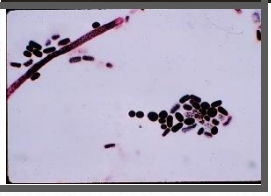
Notes:

Bacteria Summary

Organism	Size (mm	Appearance/ Color	Hemolysis	H2O	KOH	Gram Stain	Picture
Staph. Aureus	1---2	white, cream, <lat, round	Double/ Clear zone Coagulase Positive	ti	...	gram positive,cocci	
Staph. sp.	1---2	white, yellow, <lat, round	Clear or none Coagulase Negative	ti	...	gram positive, cocci	
Strep ag	<1---1	clear, small, round	None to greening camp (ti), esc-	...	...	gram positive, cocci beading	
Strep uberis	<1---1	clear, small, round	None to greening camp (ti), esc-	...	...	gram positive, cocci beading	
Strep. sp.	<1---1	clear, small, round	Clear to greening, camp (---), esc ti/---	...	...	gram positive, cocci beading	
Coliforms	1---3	white, gray, creamy to mucoid	none to clearing	ti	ti	gram negative, rods	
Corynebacteria	<1---1	white, yellow, raised, dry	none	ti	...	Gram positive, rods, clubs, palisades, seagulls	

Organism	Size (mm)	Appearance/ Color	Hemolysis	H2O 2	KOH	Gram Stain	
Arcanobacteium Pyogenes	<1---1	clear, pinpoint	clearing	...	...	sm gram positive, rods	
Bacillus	2---4	white, gray, rough, mat, dry	none to clearing, halo	ti	...	gram positive rods, box cars	
Nocardia	1---2	white, gray, brown, powdery, dry, raised	none	ti	...	gram positive, rods, <ilament, branching, acid, fast	
Prototheca	**<1@ 24 hrs**	**white to tan, sooth, heaped, moist**	**none**	**ti**	..	**endospores produced by internal segmentation**	
Yeast	**<1@ 24 hrs**	**white, cream, dry**	**none**	**ti**	..	**gram positive, large football shapes, budding**	

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Notes:

Type to enter text

Day 4

Practice: Continue processing samples for practice (un-guided); record keeping

Practice: reading samples

Introduce group presentations – group of 4 trainees will develop a presentation to give on the day 11 detailing implementation upon return to Rwanda.

Lecture: Pricing

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Milk Quality L•b Form

Page _____ of

Lab Accossion No .: _____ Ptato BSA : _____ Rold BSA : ____ Other" ._____ Rtnor1'

Oat• Received: — SHIEnrichment : _____ Plate BHI To BSA . — Road BSA Prellm ; _____

::i Oafry • Myco Ratos • _____ Read Myco .C Cay : ____ Road Myoo 7 O•Y Final

Vetorfnarlan Myco Ellrichment : _____ Read MB ..day : _____ Read MB 7 day - _____ Send Results To·

Total samples : ____ Cows ___ Tank : Somatic Cell Count : _____

Sle ID	Quarter	Sat	CMT;	I		2		3		4		BHI	. oc:h TestS	Mrc	MB	\fyco Follow Up

S3mple lID	Quarter	Scat	CIT	I		2		3		4		BHI	Bench Tests	Myc	MB	ço Follow Lp

S3mple ID	Qu.aner	Stat	CMT	I		2		3		4		BHI	Bench Tests	!vf)C	MB	Myoo i;"ollow Up

S:unple ID	Quaner	Sut	CMT			2		3		4		BHI	Bench Tests	Myc	MB	Myoo Follow Up

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Reading Plates

Common Bacteria Types

Basic supplies used for reading BBA (bovine blood agar) and WC (bovine washed blood agar) plates.

A. Good fluorescent light source.
B. Glass slides
C. Gram staining kit
D. Compound microscope with oil objective. 3% KOH: Differentiates between gram negative (positive KOH test) and gram positive (negative KOH test) bacteria.
E. 3% H2O2 for catalase test: Differentiates between staphylococci (catalase positive) and streptococci (catalase negative).
F. Micrococcus (Staphylococcus epidermidis, etc. (coagulase negative).
G. Latex (Immcell) can also be used for the coagulase test.
H. Beta toxin for the CAMP test. (*Streptococcus agalactiae*)

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Reading Plates

Notes:

When reading the plate cultures it is important to remember that cultures with pure (only one organism) bacterial growth should be considered significant, with the exception of *S. agalactiae* and *S. aureus.* A sample with more than one organism should be considered contaminated and resampled. Re--- cord the number of colonies of each organism per sample on your laboratory sheet.

MIXED AND CONTAMINATED SAMPLES

(These numbers can be an estimation of the colonies that are in the sample). Because of the experience required to read mycoplasma organisms, I will not go into detail about them. If you wish to read mycoplasma plates, you will need to spend time with someone who can view microscopic organisms in detail using a microscope.

The numbers are generally recorded as:

100 or <= count or estimate up to 100 colonies

1P = 100 plus colonies

2P = 200 plus colonies

3P = 300 plus colonies

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Notes:

4P = 400 plus colonies/Too numerous to count (solid colonies)

Consider the bacteria, CMT, and the milk appearance to determine if the presence of the bacteria are significant. The presence of bacteria in the sample does not always indicate that the organism is responsible for infection. Many of the environmental organisms can occupy the teat canal and teat surface and not cause significant problems or infections.

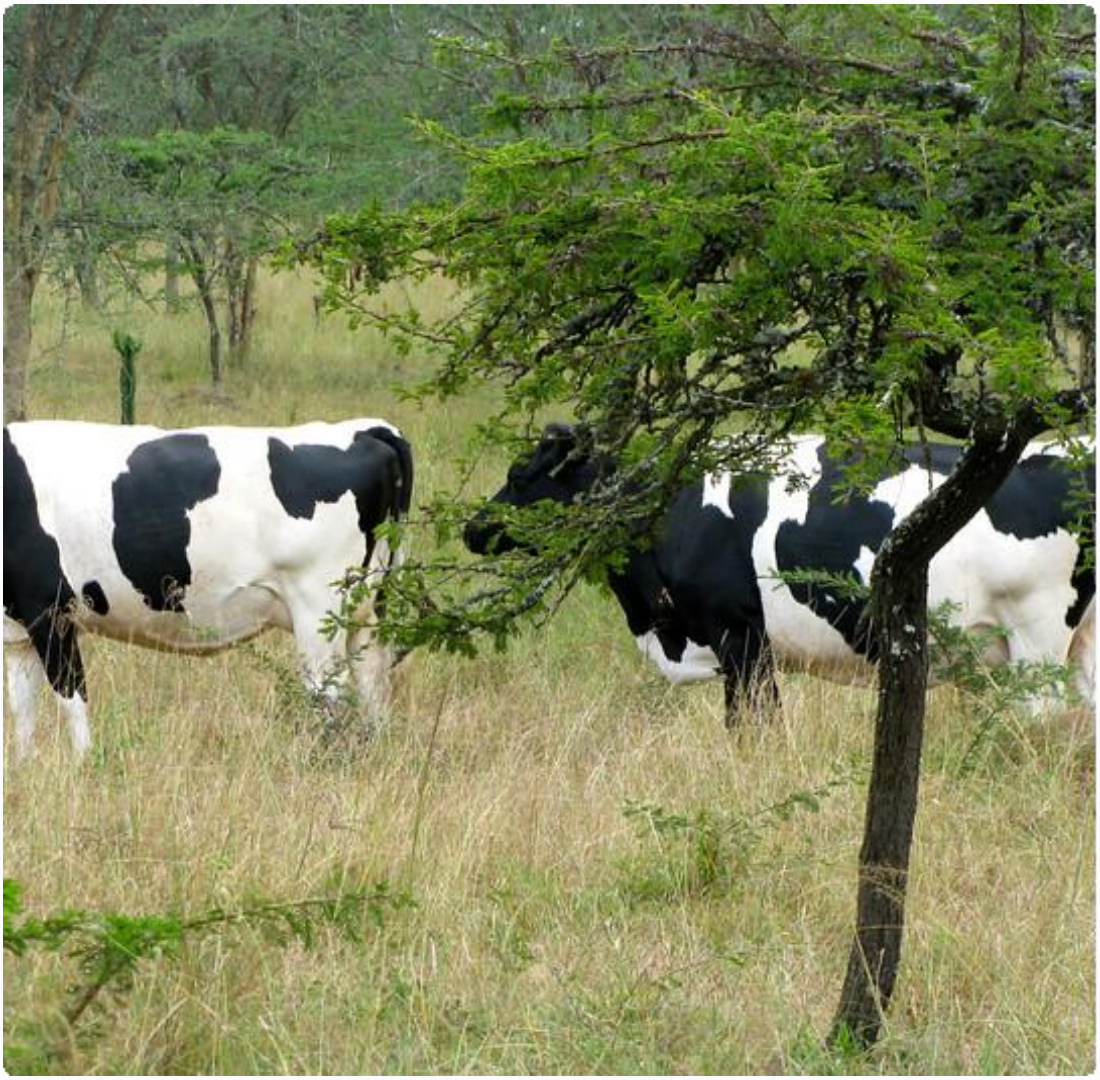
Notes:

Day 5

Practice: Continue processing samples for practice (un-guided) – 4 day plating only; plate reading; record keeping

Demonstration: Good practices: generating, recording, management and transferring data.

Introduce group presentations – group of 4--- trainees will develop a presentation to give on the day 11 detailing implementation upon return to Rwanda.



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Milk Quality Lab Form

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Rtld BBA : _____

Othor: _____

Reports

Date Recclved : _____

BHIEnrichment : _____

Pl1to BHI To BBA. _____

Road BBA _____

Prellm; _____

Rold Myoo 7 01y _____

Final _____

Dail)' :. _____

Myco Plates : _____

ROid Myco<C D 1y

Veterinarian : _____

Myco Enrichment : _____

Road MB '4 d1y :

Read MB 7 day - _____

Send Remits To

Total samples : _____ Cows : _____ Tank : _____ Somatic Cell Count : _____

S3JTIPle ID	Quarter	Sclt	CMT		2	3	4	BHI	Bench TestS	MyC	MB	Myco Follow Up
S3mple ID	Quarter	Stat	CMT		2	)	4	Bl-II	Bench Tests	Myc	MB	iyco Follow Lp
S:imple ID	Quarter	Stat	C\MT		2	3	4	BHI	Bench Tests	Myc	MB	Myoo J='ollow Up
Sample ID	Qu.ltter	Ser	CMT		2	3	4	BHl	Balch Tests	Mc	fB	Myoo Follow U

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Day 6

Team Building
Time to work on group presentation

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Day 7

Team Building
Time to work on group presentation

Day 8

Practicum: Individual unguided sample processing incl. mastitis identification, plate reading, bench tests, differential characteristics of bacteria; bacteriological identification
– Sample Set A

Introduce basics of effective videoconferencing and Skype

Time for work on group presentation

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Milk Quality Lab Form

Page _____ of

Lib Accession No :. Piile BBA : _____ Rtld BBA : _____ Othor: _____ **Reports**

Date Recclved : Dail)' :. BHIEnrichment : _____ Myco Plates : _____ Pl1to BHI To BBA. _____ ROid Myco<C D 1y Road BBA _____ Rold Myoo 7 01y _____ Prellm; Final _____

Veterinarian : Myco Enrichment : _____ Road MB '4 d1y Read MB 7 day - _____ Send Remits To

Totalsamples : _____ Cows : _____ Tank ; _____ Somatic Cell Court : _____

S3JTIPle ID	Quarter	Sclt	CMT		2	3	4	BHI	Bench TestS	M}'C	MB	Myco Follow Up

S3mple ID	Quarter	Stat	CMT		2	)	4	Bl-II	Bench Tests	Myc	MB	iyco Follow Lp

S:imple ID	Quarter	Stat	Cl\LT		2	3	4	BHI	Bench Tests	Myc	MB	Myoo J='ollow Up

Sample ID	Qu.ltter	Ser	CMT		2	3	4	BHl	Balch Tests	Mc	fB	Myoo Follow Up

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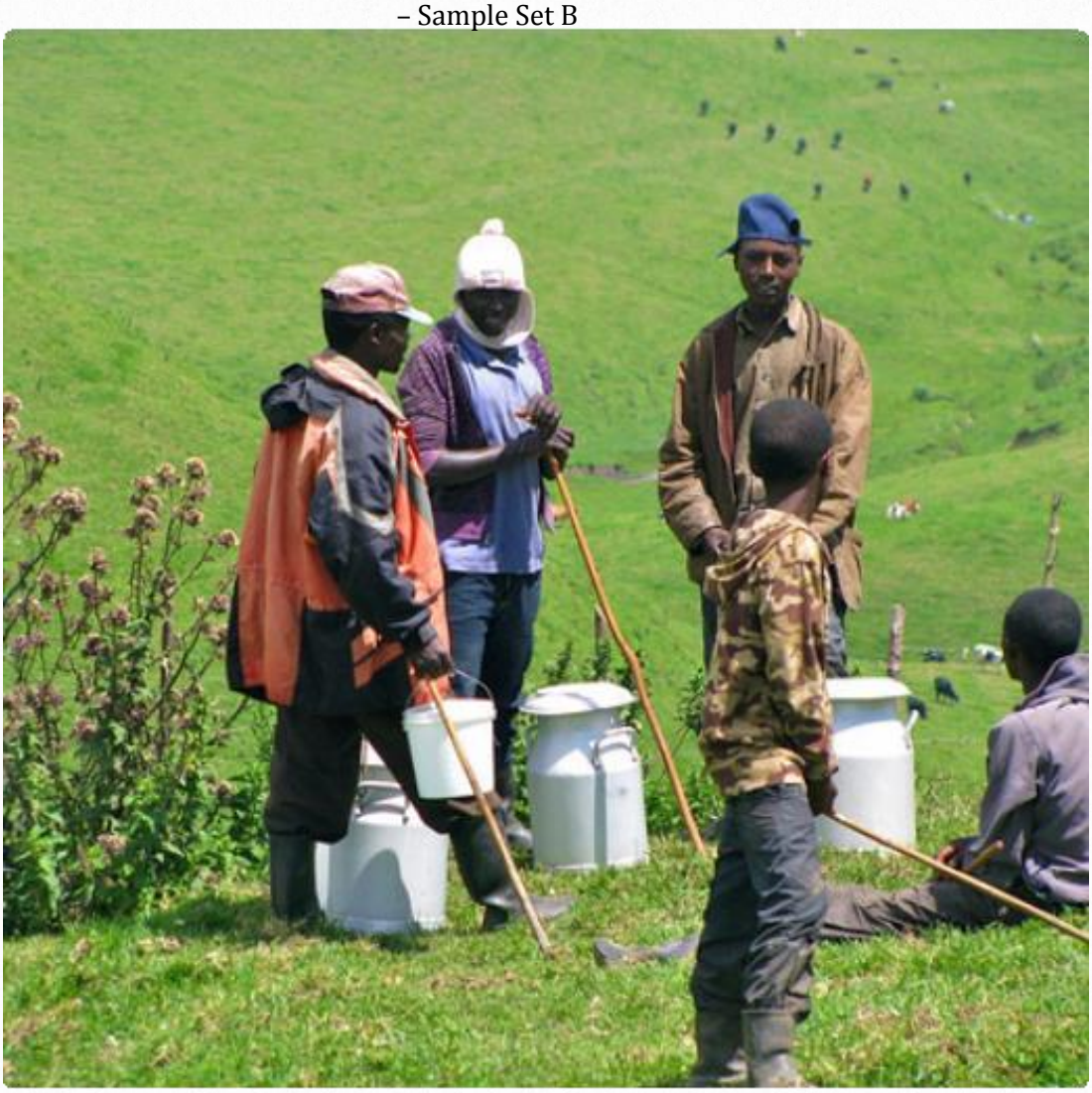
Day 9

Practicum: Individual unguided sample processing incl. mastitis identification, plate reading, bench tests, differential characteristics of bacteria; bacteriological identification
– Sample Set B

Field trip: Dairy Teaching and Research Facility (TBD)



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Milk Quality Lab Form

Page _____ of

Lib Accession No : _____

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Reports

Date Recclved : _____

BHIEnrichment : _____

Pl1to BHI To BBA. _____

Road BBA _____

Prellm: _____

ROid Myco<C D 1y _____

Rold Myoo 7 01y _____

Final _____

Dail)' :. _____

Myco Plates : _____

Veterinarian :

Myco Enrichment : _____

Road MB '4 d1y: _____

Read MB 7 day - _____

Send Remits To _____

Totalsamples : _____ Cows : _____ Tank ; _____

Somatic Cell Court : _____

S3JTIPle ID	Quarter	Sclt	CMT	1	2	3	4	BHI	Bench TestS	MJ'C	MB	Myco Follow Up

S3mple ID	Quarter	Stat	CMT	1	2	3	4	BI-II	Bench Tests	Myc	MB	iyco Follow Lp

S:imple ID	Quarter	Stat	CI\1T	1	2	3	4	BHI	Bench Tests	Myc	MB	Myoo J='ollow Up

Sample ID	Qu.ltter	Ser	CMT		2	3	4	BHl	Balch Tests	Mc	fB	Myoo Follow Up

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Day 10/11/12

Discussion

Training Evaluation (separate)

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Group Presentation Evaluation

Post-Training Survey

Thank you for taking the time to participate in this workshop evaluation. Your comments will enable us to better plan and execute future workshops and tailor them to meet your needs.

Name (optional):

1) How satisfied were you with the conference materials provided?

- Very Dissatisfied
- Dissatisfied
- Satisfied
- Very Satisfied

2) Overall, how satisfied were you with the speakers/presenters?

- Very Dissatisfied
- Dissatisfied
- Satisfied
- Very Satisfied

3) Did you feel the length of workshop sessions were too long, just about right, or too short?

- Too long
- Just about right
- Too short

4) The content of workshop sessions was appropriate and informative.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

5) The workshop was well organized.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

6) Workshop staff was helpful and courteous.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

7) What kinds of sessions/improvement opportunities would you like to see included at future workshops?

8) What did you like most about the workshop?

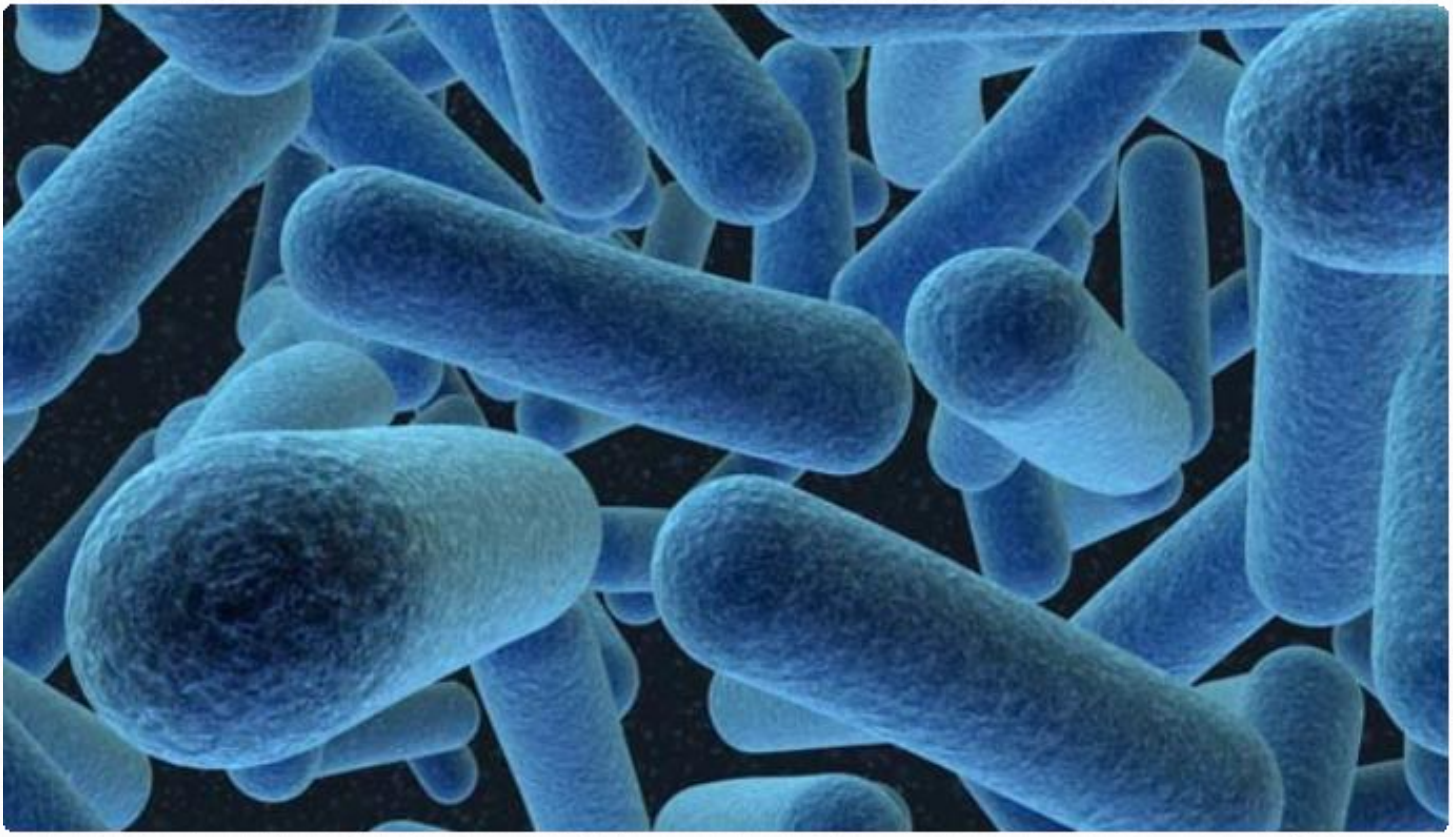
9) What did you like least about the workshop? How could we improve these concerns?

Thank you again for taking the time to participate in this conference evaluation. Your comments are important to us and to the future of this conference. If you have any further questions or concerns please contact Somen Nandi at snandi@ucdavis.edu

Appendices

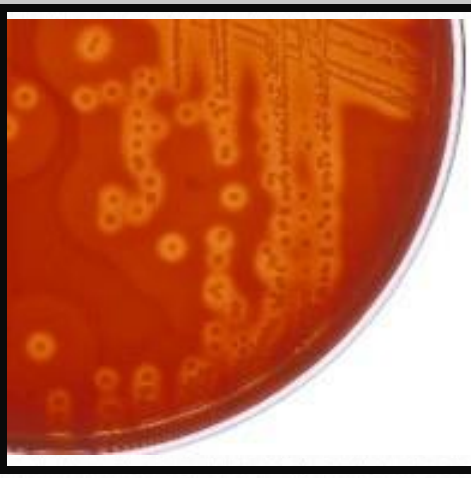
A Quick Reference for Common Milk-Borne Bacteria

Appendix A: Bacteria Identification Flashcards



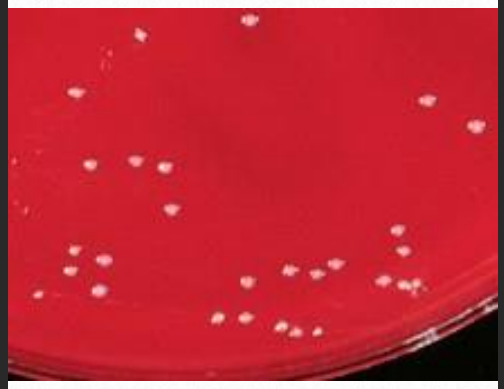
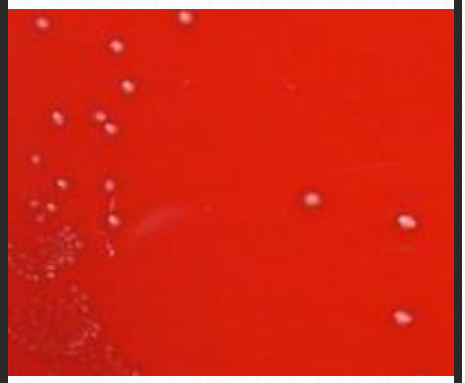
Staphylococcus aureus

Size	Color/Appearance	Hemolysis	Bench Test	Gram Stain
1-2 mm	White, Cream, Or Yellow/ Round	None to clearing (some can have a small alpha zone)	Catalase positive, KOH negative, Coagulase positive	Gram positive cocci (bunching)

Pictures		
		

**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Streptococcus species

Pictures		
		

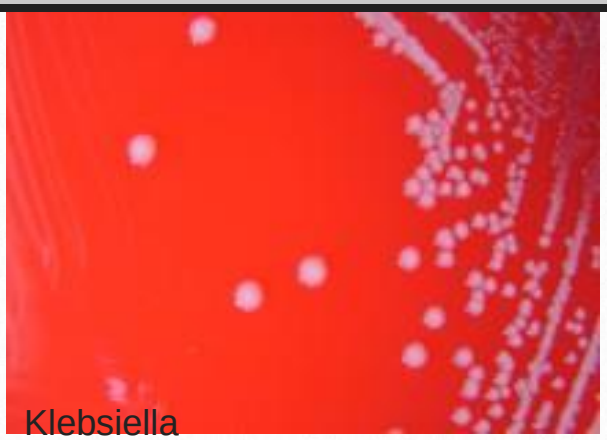
Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
<1-1 mm	Clear/ Small, Pinpoint, Round	None to clearing (some can have a small alpha zone)	Catalase negative, KOH negative, CAMP positive OR negative, Esculin positive OR negative	Gram positive cocci, chaining/ beading

**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Type to enter text

Organisms identified as *Streptococcus species* may include:

- ***Streptococcus acidominimus***
- ***Streptococcus agalactiae***
- ***Streptococcus bovis***
- ***Streptococcus dysgalactiae***
- ***Streptococcus uberis***

Pictures	
 Klebsiella	E. Coli

- ***Enterococccus faecalis***
- ***Enterococcus faecium***
- ***Entercococus durans***

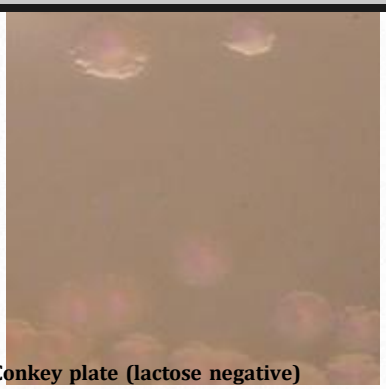
Coliform

Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
1-3 mm	White, Gray/ Creamy to Mucoid	None to Clearing	Catalase positive, KOH Positive	Gram Positive Rods

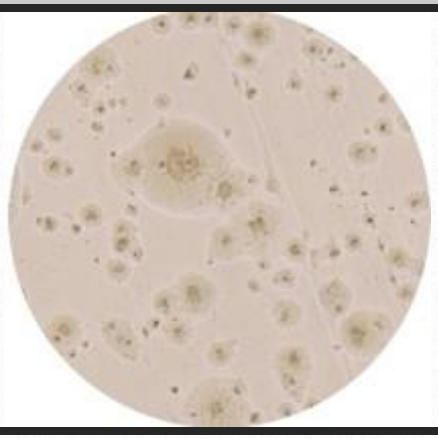
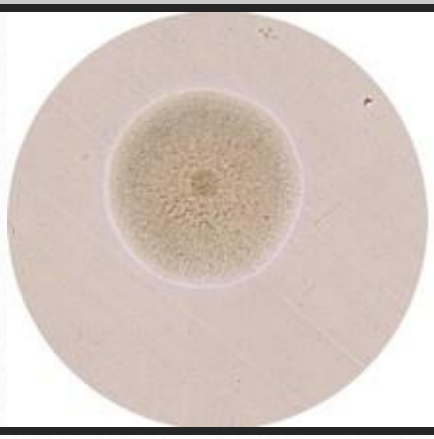
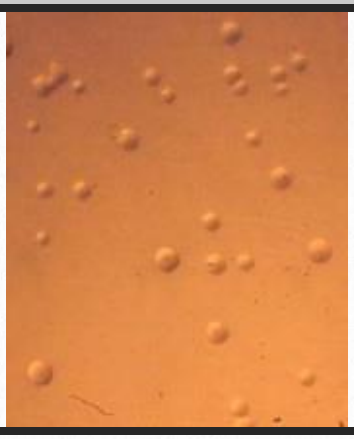
**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Organisms identified as Coliforms may include:

- ***Serratia***
- ***E. coli***
- ***Klebsiella***
- ***Enterobacter***
- ***Citrobacter***

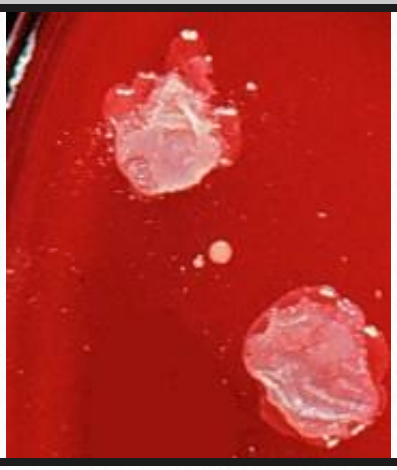
Pictures		
	 McConkey plate (lactose negative)	

Pseudomonas aeruginosa

Pictures		
		

Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
1-3 mm	Grayish Colonies/ Irregularly shaped margins	Green or Yellowish, Green pigments may be seen, Frequently beta-hemolyic, cultures may have a fruit-like odor	KOH positive	Gram Negative Rods

**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Pictures		
		

Mycoplasma

Size	Magnification	Hemolysis	Bench Test	Color/ Appearance
Microscopic at 4 days of Incubation	5x-30x magnification using dissection microscope	none	Serologic Typing	Translucent to tan/Resembles fried egg

Cultured on Mycoplasma Agar

Pictures		

**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Bacillus species

Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
2-4 mm	White, Gray/ Rough, Mat, Dry	None to clearing, Halo	H_2O_2 Positive, KOH Negative	Gram Positive Rods, Box Cars

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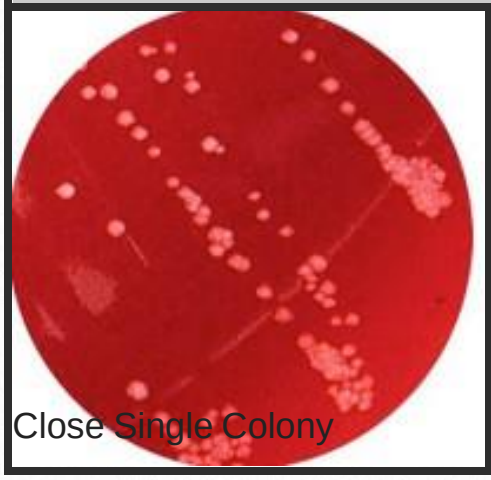
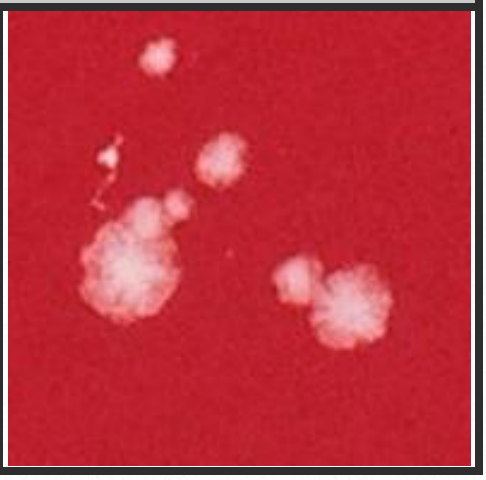
**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Pictures		
 Close Single Colony	Pure Culture	

Arcanobacteria pyogenes (Actinomyces pyogenes)

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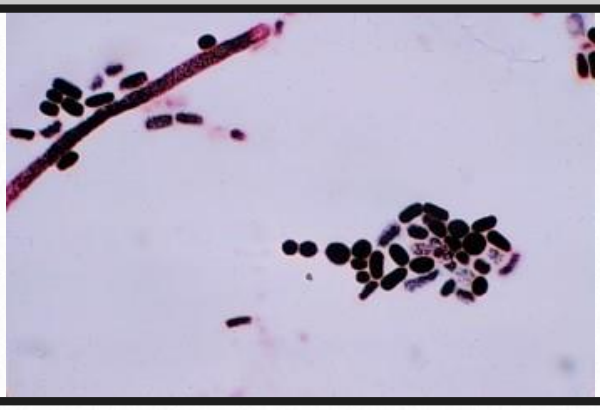
Picture


Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
<1-1 mm	Clear/Sparse Growth at 24 Hours	Beta Hemolytic or “hazy hemolysis”	Catalase negative, KOH negative	Gram positive rods, pheomorphic rods, may form “palisades” or “Chinese Letters”

Type to enter text

Corynebacterium species

Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
<1-1 mm	White or Yellow/ Raised, Dry	None	Catalase negative, KOH negative	Gram positive rods, pheomorphic rods, may form “palisades” or “Chinese Letters”, gram positive rods, tiny pairing (seagulls)

**All isolates from bovine milk cultures on bovine blood agar (Washed Cow)

Yeast

Size	Color/ Appearance	Hemolysis	Bench Test	Gram Stain
1-2 mm at 48 Hours	White, Cream/ Dry	None	Catalase negative, KOH negative	Gram Positive, Large Football Shapes, Budding

Type to enter text

Appendix B: Glossary

CMT: California Mastitis Test

LOL,IDD: Land O' Lakes,

USAID

GHS: Global HealthShare

SCC

BBA: Bovine Blood Agar

WE: Bovine Washed Blood Agar

KOH: Potassium Hydroxided

H2O2:

ISAE:

UP:

UC Davis: University of California Davis

DDM:

Participants

Affiliation	Name	Specialization/ Designation	Role

Notes

Notes