

# R4D *Highlights*



## Realignment of researches with DA's objectives urged

By MERVALYN TOMAS

**M**ore research focus should be placed on directly addressing the problems in the carabao industry such as raising the country's milk production from 1% to 10%, among other challenges indicated in the Value Chain Analysis (VCA).

Dr. Arnel del Barrio, PCC Executive Director, made this call to PCC researchers during the Research for Development (R4D) In-house Review last July 4-6.

"The Department of Agriculture's (DA) objectives are to make food available and affordable, increase income of farmers and fisherfolks, and increase resilience in the practice of agriculture to climate

change risks," Dr. del Barrio said.

He said PCC researches should be clearly aligned with the objectives being pursued by the DA.

The review, according to Dr. Annabelle Sarabia, Research and Development Division Chief, is done yearly to evaluate the completed and ongoing research activities in the agency. She added this

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## Realignment... (From page 1)

annual activity serves as a venue where research results are presented and evaluated. It also serves as an opportunity to motivate researchers to align their interest with that of the agency's mandate and to recognize those who generate excellent research outputs.

"Interaction and sharing of learnings between and among scientists and researchers are important in this review to ensure that research efforts are monitored and evaluated according to the agency's R4D agenda," Dr. Sarabia explained.

The review is comprised of 43 ongoing and completed researches, undergraduate student theses, internally and externally-funded studies, and commissioned researches.

Adjudged "Best Paper" in the completed research category was the study titled "Enhancing AI Efficiency through Synchronized Ovulation and Fixed Time AI in Water Buffaloes." This research was conducted by Dr. Eufrocina Atabay, Dr. Edwin Atabay, Excel Rio Maylem, Dr. Ramesh Tilwani, Dr. Esther Flores, and Dr. Annabelle Sarabia.

The paper titled "Developmental Competence of Embryos Produced in Vitro from High and Low-Fertile Bulls Classified by Fourier Harmonic Analysis," presented by Herren Donna Daag, won as the "Best Undergraduate Student Research Paper". The research was conducted under the advisory of Dr. Peregrino Duran and Dr. Danilda Duran.

Dr. Joram Gautane, science research specialist of the Biosafety and Environment Section, who presented the study "Development of Loop-Mediated Isothermal Amplification (LAMP) Assay-Based Test Kit for the Detection/Screening of Caprine Arthritis Encephalitis Virus (CAEV)" which he co-authored, bagged the "Best Presenter" award.

The evaluators of the presented researches were Dr. Ma. Anita M. Bautista, UP Diliman Assistant Professor VII; Dr. Consuelo Amor S. Estrella, University of the Philippines-Los Baños Associate Professor II; Dr. Cristina F. Olo, Cavite State University Professor VI ; and Peter James C. Icalia, Mariano Marcos State University Instructor III.



Dr. Eufrocina Atabay (second from right) receives the "Best Paper Award" for the study titled "Enhancing AI Efficiency through Synchronized Ovulation and Fixed Time AI in Water Buffaloes". She is the lead researcher of the winning paper.



Dr. Atabay presents her team's research during the 2017 R4D In-house review.

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# Improved Fixed-Time AI protocol increases pregnancy rate in water buffaloes, study says

BY EUFROCINA ATABAY AND MERVALYN TOMAS



**T**he use of CIDR-Synch-hCG can increase pregnancy rate in buffaloes, according to a research done by scientists and researchers of the Philippine Carabao Center (PCC).

In a research titled “Enhancing AI Efficiency through Synchronized Ovulation and Fixed Time AI in Buffaloes” by Eufrocina P. Atabay, Edwin C. Atabay, Excel Rio S. Maylem, Ramesh C. Tilwani, Ester B. Flores, and Anabelle S. Sarabia, the original ovulation synchronization protocol (Ovsynch) has been modified and optimized by using a progesterone based protocol (CIDR-Synch-hCG) which increased pregnancy rate in buffaloes.

In this protocol, a CIDR device insertion is done simultaneously with the first gonadotropin-releasing hormone (GnRH) injection; and for the second injection, the hormone called human Chorionic Gonadotropin or hCG is injected to the buffaloes instead of the widely-used GnRH.

## **FTAI in general**

Basically, the FTAI is anchored on the synchronization of ovulation followed by timed AI allowing more precise timing of insemination. This is opposed to the conventional AI where insemination is based on estrus synchronization which presents wider and variable ovulation

occurrence.

The original ovulation synchronization protocol is called “Ovsynch” method. Historically, Ovsynch uses the hormone GnRH and prostaglandin (PGF $2\alpha$ ) hormones, which had been initially adopted in PCC’s FTAI activities in buffaloes. Essentially, the major effect of Ovsynch procedure is the tight synchrony of ovulation among animals and the conduct of AI without the need for heat detection.

However, the effectiveness of this strategy can be influenced by various factors which can limit its widespread application and its full potential for buffalo reproduction. Therefore, there is a need to optimize the current methods in order to come up with suitable and effective FTAI protocols.

## **Results**

Two studies were carried out in the research. One compared the efficacy of the widely-used ovulation synchronization protocols (Ovsynch and CIDR-Synch) using the hormone GnRH, and the other, compared the effects of the ovulatory hormones used in FTAI (hCG and GnRH) in optimizing the CIDR-Synch protocol.

The first study revealed a conception rate of 31.63% for Ovsynch and 43.06% for CIDR-SYNCH protocol. These are

significantly different.

The second study showed that the use of hCG in the CIDR-Synch program results in large diameter size of preovulatory follicles indicating that the hCG is more effective than GnRH for the final maturation and ovulation of follicles.

In summary, the efficiency of Ovsynch protocol in terms of pregnancy (31.63%) can be improved with CIDR-Synch protocol (43.06%), and the substitution of GnRH with hCG resulted in the largest diameter of preovulatory follicle, highest ovulation, and conception rate of 58.04%. Currently, CIDR-Synch-hCG protocol is being used in the expanded FTAI activities in PCC Regional Centers and some multiplier farms in the country.

The application of FTAI technology in the study did not only demonstrate improvement in AI efficiency but it also allowed exploration and understanding of intrinsic problems in buffalo reproduction providing direction on appropriate management intervention to maximize reproductive performance in water buffaloes.

### **About the researcher**

Dr. Eufrocina Atabay, Scientist I, is the head of the Reproduction and Physiology Section of PCC’s Research and Development Division.

# Selenium influences spermatozoa, semen production quality of buffaloes

BY DANIEL AQUINO AND CHARLENE CORPUZ

**S**elenium is well-known as an essential trace and indispensable element in the growth and reproduction of animals because it helps improve the semen quality and production of spermatozoa.

Its characteristics, though, have yet to be proven among riverine buffalo bulls. Thus, researchers did a study to discover selenium's effect on this particular animal.

The subjects for experimentation were 30 healthy riverine buffalo bulls (Bulgarian, Brazilian and Italian breeds) with ages ranging from 3-7 years old. They underwent initial assessment and were found clinically free of internal and external parasites.

In the study, the researchers used different feeding and management systems in observing the buffaloes. The animals were fed daily with 2 kilogram feed concentrates. The forage-based ration is composed of silage/haylage with supplementary 0.02% of urea, 0.01% of salt, 0.01% dicalcium phosphate

and mineral blocks. Different levels of commercially available *Excellential Selenium 4000* based on EU maximum allowable levels were introduced by top-dressing into the daily ration of the bull. It was then evaluated if these can influence semen production and quality of spermatozoa.

The buffaloes were maintained on the said diets for three months. Then, semen ejaculates were collected, evaluated and characterized based on concentration, motility and morphology (abnormality), to assess the effect of selenium concentrations (T1 - 10% above the published requirement level; T2- 5% above; T3 - 100% (control); T4 - 5% below and T5 - 10% below the requirement of selenium).

The study revealed that the supplementary selenium at 5% level above the published requirement for bull (T4) caused improvements in volume of ejaculates and sperm concentration.

It was proven in the study that selenium

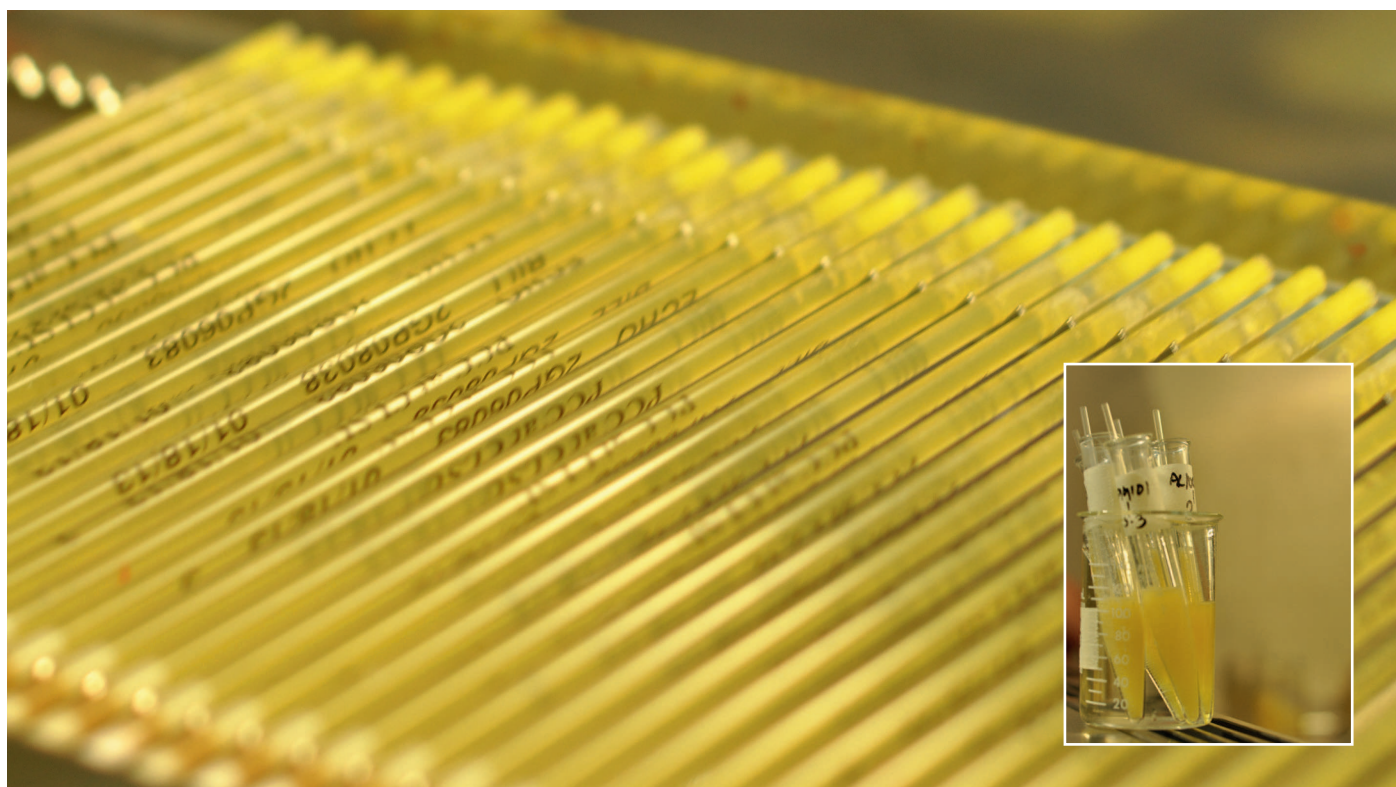
supplementation to a bull diet provides additional benefit compared to the non-supplemented control diet by improving sperm quality in terms of motility and lowest abnormal sperm values.

Selenium may be tightly regulated by the bull's reproductive tract, thereby standardizing the effects of selenium on semen production and sperm quality.

The Philippine Carabao Center (PCC) and Biology Department of Central Luzon State University (CLSU) conducted the research study engaging researchers namely Maorin Mari Santos, Ma. Elizabeth Leoveras, Dr. Daniel Aquino, Edward Paraguison and Emma Venturina.

## About the researcher

Dr. Daniel Aquino, Supervising Science Research Specialist, is a technical expert on animal nutrition and is currently the Center Director of PCC at CLSU. The said center is one of the 12 centers of PCC nationwide. It is located in the Science City of Muñoz, Nueva Ecija.



Semen collected from buffaloes were evaluated and characterized in the study.



# Betel nut extract shows significant anthelmintic effects on motility, morphology of Liver Fluke (*Fasciola* spp.), study says

BY PAULA BLANCA GABAN AND MA. CECILIA IRANG



Paula Blanca Gaban, one of the researchers, soaks liver flukes in different treatments, which consisted of various concentrations of both betel nut and neem leaf extracts.

**I**n the Philippines, the practice of using herbal plants in treating livestock diseases such as fasciolosis is getting more popular due to rapid increase in cost and sometimes unavailability of anthelmintic drugs in the market.

Some serious disadvantages in using chemical dewormers may occur, which include drug resistance, chemical residue in meat and milk, environmental pollution, toxicity problems, failed snail control measures, and long withdrawal period prior to slaughter.

This, therefore, prompted researchers to conduct a study titled “The Effect of Betel Nut (*Areca catechu*) and Neem (*Azadirachta indica*) Leaf Extract on the Motility and Morphology of Liver Fluke (*Fasciola* spp.)”.

It was meant to measure the anthelmintic effects of plant extracts such as betel nut and neem leaf extracts against *Fasciola* spp. in vitro in comparison with the

commercial dewormer Albendazole.

Fasciolosis is one of the most common parasitic bovine and bubaline diseases in the Philippines usually affecting livestock, wildlife, and pet animals. It is caused by *Fasciola hepatica* and *Fasciola gigantica* which occurs commonly in temperate and tropical regions, respectively.

This disease can result in confiscated liver, reduced milk yield, fertility and meat production, and can adversely affect wool quality and weight gain of the animal.

Currently, there are several effective controls of fasciolosis, such as strategic and tactile use of anthelmintic drugs and proper management of grazing lands, control of stocking rates, and appropriate rotational grazing strategies.

In order to measure the anthelmintic effects of plant extracts against *Fasciola* spp., live liver fluke specimens were collected directly from the liver of buffaloes bought at the slaughter house of San Jose City, Nueva Ecija.

Fresh mature betel nuts and neem leaf samples, on the other hand, were collected from Pagudpud, Ilocos Norte and Central Luzon State University, Nueva Ecija.

Right after collection, the flukes were immediately exposed to the different treatments. The motility of the flukes was recorded. Only flukes that exhibit motility by visual inspection and with normal gross morphologic tegument were selected.

The study determined the extract concentration that produced the highest efficacy based on the average recorded mean motility time, gross and microscopic changes of the flukes treated with different concentrations of plant extracts.

The researchers used eight treatments that consisted of 10%, 20%, 40% concentrations of both betel nut and neem leaf extracts. Positive control treatment (Albendazole-treated) and negative control treatment (25mL nutrient broth) were used.

The motility of the flukes on all treatments was based on the established motility criteria scoring: Score 3 – moving whole body; Score 2 – moving 50 % of the parts of the body; Score 1 – immobile but microscopically alive; Score 0 – dead. The flukes subjected to all treatments were processed for histopathological analysis.

It was revealed that after exposure of *Fasciola* spp. under 10%, 20%, and 40% extract concentrations, betel nut extract showed higher efficacy having the recorded mean motility time of 0.22 minute, 0.07 minute and no movement upon contact respectively than Albendazole, which is highly effective at 10% and produced 100% efficacy at an average mean motility time of 0.38 minutes of exposure.

The flukes treated with 10%, 20%, and 40% neem leaf extracts obtained the average mean motility time of 220 minutes, 151 minutes, and 98 minutes.

(Continued on page 10)



# Pathogenic *Leptospira* species in large ruminants can possibly cause big economic loss in livestock industry

By MA. CECILIA IRANG AND MARVIN VILLANUEVA



**The economic damage of leptospirosis in the livestock industry is believed to be considerable.**

Thus, the study titled “Molecular epidemiology of Pathogenic *Leptospira* spp. among Large Ruminants in the Philippines”, was conducted. It was meant to determine the local prevalence and carrier status of leptospirosis among water buffalo and cattle using molecular techniques and to assess the risk factors of acquiring leptospirosis in these animals.

The research team was composed of Dr. Marvin A. Villanueva, Dr. Claro N. Mingala, Dr. Michelle M. Balbin, Dr. Chie Nakajima, Dr. Norikazu Isoda, Dr. Yasuhiko Suzuki, and Dr. Nobuo Koizumi.

## **What leptospirosis is**

Leptospirosis is an important re-emerging zoonotic disease worldwide, and is predominantly found in developing

countries with tropical or subtropical climates.

It is caused by gram-negative spirochetes from the genus *Leptospira* which is divided into pathogenic and non-pathogenic species.

Pathogenic leptospire are carried by most mammalian species such as wild, domestic and farm animals, the experts said. They can transmit infection to humans and other animals either by direct contact with the urine of a carrier animal or indirectly through urine-contaminated environment.

In livestock, leptospirosis is an important cause of decreased animal production as a result of infection by a variety of pathogenic *Leptospira* serovars or species.

Cattle are known to maintain serovar Hardjo (*L. borgpetersenii* serovar Hardjo subtype Hardjobovis and *L. interrogans* serovar Hardjo subtype Hardjoprajtino)

that often leads to subclinical and persistent infection of the reproductive tract.

Bovine leptospirosis can create serious economic losses in the livestock industry. It can cause abortions, stillbirths, infertility, reduced milk yield, mortality in calves, and decreased daily weight gain of the animal.

## **Findings and significance**

The researchers collected urine samples of 729 water buffalo and 102 cattle from 21 farms during the conduct of the study in 2013 to 2015 and were subjected to flaB-nested polymerase chain reaction (PCR) to detect pathogenic *Leptospira* spp.

*Leptospira* flaB was detected in both species with a detection rate of 16.1%.

Based on the results of the study, Leptospiral DNA was mainly detected in samples from animals managed in



communal farms. Sequence analysis of partial *Leptospira* flaB in large ruminants revealed the formation of three major clusters with *L. borgpetersenii* or *L. kirschneri*.

One farm contained *Leptospira* flaB sequences from all clusters identified in the study, suggesting that this farm was the main source of leptospires for other farms.

The study suggested that these large ruminants are infected with various pathogenic *Leptospira* species causing possible major economic loss in the livestock industry as well as potential *Leptospira* reservoirs that can transmit infection to humans and other animals in the Philippines.

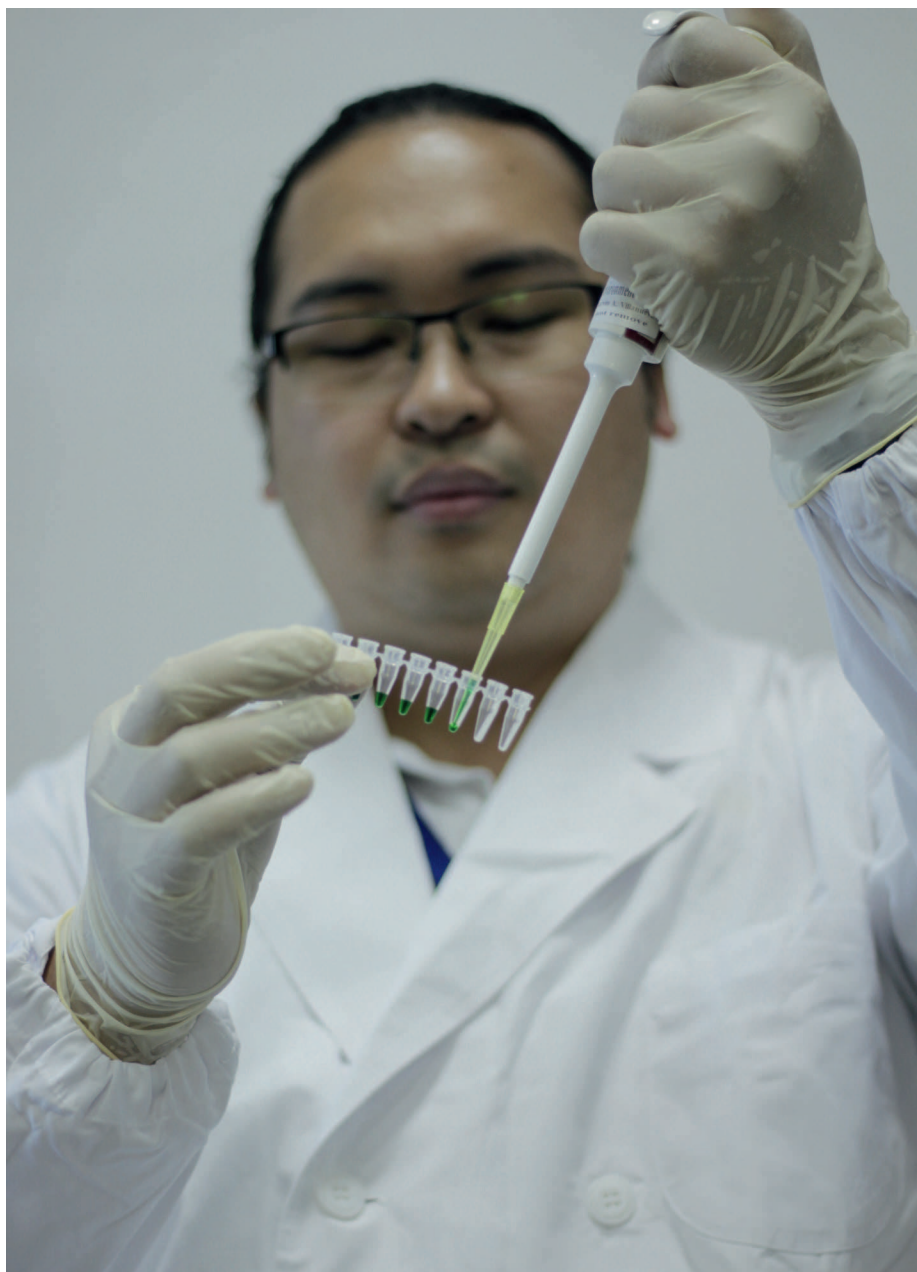
The main goal was to check if PCC's water buffaloes and cattle were infected with pathogenic leptospires. The researchers found out and detected 16.1%, thus, gave a reminder to regularly monitor the animals if they are infected through PCR as it can possibly affect the production of buffaloes.

Cases like abortion and low milk production of buffaloes may probably occur as well. Further studies are needed to prove this theory.

Further investigations into the effect of *Leptospira* virulence on the reproductive performance of these animals and elucidation of the role of livestock as either accidental or maintenance hosts are needed to take future actions to prevent leptospirosis from causing risks to public health and economic losses to the large ruminant industry in the Philippines.

A follow-up study on this will be done. Bacteria from the positive cases will be isolated using the urine samples, and the isolates will be subjected to pathogenicity test. The pathogenicity test will be done by infecting the golden Syrian hamster with the *Leptospira* isolates from infected buffaloes, and its effects will be observed if it can cause disease or death. Hamster is the best animal model for *Leptospira* study as it shows the same disease manifestation to humans.

More studies to prove that this disease can really cause abortion among buffaloes and can infect humans are needed. The only way to obtain this information is through pathogenicity test.



Dr. Marvin Villanueva prepares PCR reagents to be used in his research.

The Philippines is a leptospirosis-endemic country. However, infection in large ruminants seems neglected which may be due to difficulty in distinguishing clinical signs from other endemic diseases and the lack of appropriate diagnostic laboratory services, especially in rural areas.

Few serological studies were conducted since 1970's in which two independent studies showed anti-*Leptospira* antibodies in water buffaloes against serovars Tarassovi, Sejroe and Poi and against serovars Pyrogenes, Pomona and Grippotyphosa, respectively.

The researchers' recent findings also found evidence of high seroprevalence (48%) and MAT titers against serogroups Mini, Hebdomadis, Tarassovi and Pyrogenes among adult animals, demonstrating a

widespread occurrence of leptospirosis in a water buffalo communal farm.

To control leptospirosis, the research team recommended the imposition of strict farm biosecurity measures, periodic testing and treatment of infected herds by giving them antibiotics such as doxycycline, streptomycin, or amoxicillin, and quarantine to prevent the spread of infection from one farm to another.

#### About the researcher

Dr. Marvin Villanueva, a graduate of Doctor of Philosophy in Veterinary Medicine, is a Senior Science Research Specialist under the Biosafety and Environment Section of PCC's Research and Development Division. Several of his researches were published in journals and other publications.



# Scientists, researchers take initial step to develop vaccine against surra

By MERVALYN TOMAS, MARY ROSE UY AND CLARO MINGALA

**S**cientists and researchers from the National Institute of Molecular Biology and Biotechnology (NIMBB) and the Philippine Carabao Center (PCC) took the initial step toward the development of a vaccine against surra.

Surra is a parasitic disease caused by *Trypanosoma evansi*, a protozoan trypanosome. This disease causes weakness, edema (abnormal accumulation of fluid in certain tissues within the body), and pyrexia (raised body temperature or fever) in infected animals.

It is one of the economically disruptive diseases affecting livestock. Some buffaloes become cryptic hosts to *T. evansi*. Though there may be no overt symptoms, the effects could be still births and abortions.

The PCC uses three drugs in treating surra cases. These antiprotozoal drugs are isometamidium chloride, diminazene aceturate and melarsamine hydrochloride (cymelarsan).

However, the researchers observed that there are instances when these drugs are less effective to some isolates. It is not known whether this phenotype (drug resistance) is correlated with variations that can be found in target gene markers (e.g. variant surface glycoproteins,

flagellar proteins) but it can serve to model the spread of drug-resistant genes in the population.

Hence, a study was done to identify potential markers for drug resistance, to sequence and analyze strain and virulence markers, to biobank and archive samples, and eventually use these resources for the development of vaccine against surra.

The researchers isolated 15 strains of *T. evansi* from trypanosoma-positive blood samples from different parts of the Philippines. The strains were propagated in mice then subjected to in vitro (experiment done in a test tube) drug sensitivity testing and whole genome sequencing.

They assessed the virulence of these strains based on daily parasitemia (demonstrable presence of parasites) and symptomatology (set of symptoms exhibited by infected animal) observed in mice.

## Results

All samples were subjected to whole genome sequencing to look for possible sequence variations that would account for the differences in drug resistance or susceptibility.

The genome sequence of 014 was

compared to other virulent strains. It was found to be highly virulent both in vivo (experiment using a living animal) and in vitro and was resistant to all three drugs that PCC uses to treat surra.

Since sequence 014 is resistant, it is ideal to be used as a model to determine factors that make animals resistant to the three drugs.

A vaccine that targets this resistant strain will then be developed.

Though this phase is complicated, it is only the first step in the process toward the development of a vaccine against surra.

The study, titled “Genetic Assessment of Trypanosoma towards Vaccine Development”, was conducted by Dr. Cynthia Saloma, Dr. Claro N. Mingala, Dr. Jose Enrico Lazaro, Dr. Neil Andrew Bascos, Renlyn Ivey Paynaganan, Francie Tablizo, Dr. Nancy Abes, Mary Rose Uy, Michelle Miguel, and Hector Espiritu.

### About the researchers

Mary Rose D. Uy, a graduate of BS and MS in Biology, currently works as a Science Research Specialist under the Swine Genomics Project housed at PCC.

Dr. Claro Mingala, Scientist II, is the head of the Swine Genomics Project. He is an expert in fields of veterinary immunology, microbiology, molecular biology, and public health.



# Rice straw treated with urea feed up carabao's milk production, study says

BY DANIEL AQUINO AND CHRISSALYN MARCELO

**W**hen fed with urea-treated rice straw (UTRS), the carabao yields more milk thereby providing more income benefit to the farmers by as much as 33 percent.

The UTRS consists of a combination of molasses, urea, rice straw and water.

The findings were based on the study titled, "Community-Based S & T Farm Project on the Preparation and Utilization of UTRS as Fodder for Dairy Buffaloes", conducted by a research team from the Philippine Carabao Center (PCC).

The team was composed of Dr. Daniel L. Aquino, Dr. Tsutomu Fujihara, Honorato Baltazar, Jeffrey Santos and Christian Lacanilao.

The study was conducted to find out

the efficacy of the UTRS and if found positive to promote it for adaption and possible mass production by a cooperative-led producer in the town of Llanera in Nueva Ecija.

The town produces approximately 4.5 million tons of rice straw every year. Likewise, it has three dairy buffalo cooperatives being assisted by the PCC, which are the Kapitbahayan sa A. Mabini Producers Cooperative (KAMPC), Punla Multipurpose Cooperative (PMC) and Casile Dairy Producers Cooperative (CDPC).

These coops have 93 members tending some 144 dairy buffaloes, The farmer-members separately cultivate 102 hectares of rice land that at harvest time provide abundant rice straws. (KAMPC has 25 members who have 50 buffaloes and 25 ha. land; PMC with 24 members

tending 27 ha area of land and 30 buffaloes, and CDPC with 44 members, 50 ha and 64 buffaloes).

Twenty-seven dairy buffaloes were used in the feeding trials, 19 of which were fed with UTRS while the remaining eight buffaloes were fed with pure rice straw only. Each cow was also given two kilograms of supplementary concentrates and the milk production and income derived from feeding UTRS to the animals were monitored for 210 days.

Thirty farmer-partners from the three cooperatives were trained on how to prepare UTRS. They were taught how to chop the rice straws, prepare the urea (molasses solution), treat and stack UTRS, and determine the nutritive value of untreated rice straw compared

*(Continued on page 10)*



# Betel nut...

(From page 5)

The results revealed that 40% betel nut extract concentration showed the highest efficacy based on the recorded mean motility time. All treatments of betel nut extract evidently showed marked changes in the gross and microscopic morphology of the flukes. However, neem extract was ineffective in all concentrations although changes were observed microscopically.

Researchers of the study suggested that future studies may also be conducted to consider the evaluation of the effect of both herbal plants on eggs of flukes and other helminths and determination of the lethal dose of the herbal plants for further in vivo trials.

The study also indicated that the plant extract that showed high anthelmintic activity against *Fasciola spp.* in vitro needs to be evaluated and tested in animal hosts. It may not serve as a sole alternative to anthelmintic drugs but as a part of an integrated approach, it is specifically designed to achieve a sustainable parasite control in animal production systems.

Further studies were recommended to test and evaluate the efficacy of the plant extracts as composition of an anthelmintic drug and to evaluate the pharmacokinetic effect. Their toxic effect, however, needs to be addressed first before carrying out an extensive use in the field of veterinary medicine.

The study was conducted under the auspices of the Biosafety and Environment Section of the Philippine Carabao Center in collaboration with the College of Veterinary Science and Medicine of the Central Luzon State University. The researchers were Dr. Claro Mingala, Michelle Miguel, Paula Blanca Gaban, Elnalyn Yamson and Dr. Victoria Viloria.

## About the researcher

Paula Blanca Gaban, a graduate of BS and MS in Biology, is a Science Research Specialist I under the Biosafety and Environment Section of the Research and Development Division of PCC. She was also involved in the study titled "Molecular Detection of Tetracycline Resistance Genes in *salmonella* spp isolated from pork and poultry egg".

# Rice straw...

(From page 9)



Farmers prepare rice straws to be treated with urea.

to the UTRS.

After three years of project implementation, results of the study showed that KAMPC produced 317 tons of UTRS, CDPC, 76.3 tons; and PMC, 40 tons. The rice straw materials used in the preparation of UTRS were sprayed or dipped in 2% urea-and 5% molasses solution, conserved to ferment for at least 3 weeks prior to harvest, packed in silage bags with one ton per bag sealed, and placed in bunker silo.

The researchers said that on the average, the 19 lactating buffaloes fed with UTRS gave a total milk production of 924kg per cow and the eight dairy buffaloes fed with pure rice straw produced 777kg only. This gave a difference of 147 kg in milk production for the buffaloes fed with UTRS.

The effect of UTRS on the daily milk production of buffaloes given with UTRS was 4.4kg per day while the buffaloes fed only with pure rice straw was 3.7 kg per day.

Each of the 19 lactating buffaloes fed with UTRS gained a gross income of Php48,004 while each of the eight buffaloes fed with pure rice straw, Php40,404 . Milk collected from the buffaloes were sold at Php52 per liter.

After deducting expenses, the net income was Php27,467 per head for the animals fed with UTRS which was

higher by Php6,425 than the animals fed with pure rice straw that netted Php21,042 only. The lactation period was 210 days.

This showed that more income was attained from the buffaloes fed with UTRS.

Overall, the 19 dairy buffaloes fed with UTRS had a net gain of Php353,535, higher by 33.18% compared to the animals fed with pure rice straw.

The researchers concluded that UTRS can increase buffaloes' milk production and farmers' income.

They also concluded that the preparation and utilization of the UTRS technology can:

- help solve the deficiency in fodder supply for feeding buffaloes especially in summer seasons where there is a limited source of fodder or feedstuff for dairy buffaloes;
- can be produced either in small scale or commercial scale production without much input in terms of capital and equipment; and
- serve as cheap fodder and a practical ingredient of a dairy buffalo ration.

The researchers highly recommended the UTRS for ruminant feeding and for its mass production for commercialization.



# Functional bacteria aid in full development of rumen in calves' weaning diets, study say

By DANIEL AQUINO AND CHARLENE CORPUZ

**T**he increased changes of pectinolytic, proteolytic and amylolytic bacterial population as influenced by weaning diets indicated the adjustment and adaptation of ruminal bacteria, with and without calf starter, in carabao calves.

Moreover, early introduction of weaning diets has been found to promote early development of the rumen and other digestive compartments such as reticulum, omasum and abomasum which influence early weaning of calves.

These were the findings from a research study conducted by PCC at CLSU experts titled "Microbiota Dynamics of Water Buffalo Rumen", which was done to enhance the feeding formulation and weaning management of buffalo calves.

The study was conducted to isolate, characterize, identify and compare the functional bacterial population existing and are adapting in the digestive tract fluid of buffalo calves as affected by weaning diets with and without the inclusion of calf starter through cultural, morphological and biochemical analysis.

In the study, ten calves were divided

into two groups: the control group and the treatment group, with five calves in each group. They were assigned to two weaning diets. The control group was fed with raw milk, grass (Pakchong 1), and calf pellets while the treatment group was fed with raw milk and grass (Pakchong 1) only.

The researchers isolated pectinolytic, proteolytic and amylolytic bacteria from the digestive tract fluid of the calves. Collection of fluid was done on the 1<sup>st</sup>, 6<sup>th</sup>, 16<sup>th</sup> and 30<sup>th</sup> day since the calves' birth. Then, the isolates were characterized through cultural, morphological and biochemical analysis.

The study assessed and analyzed the colony counts of functional bacterial population to compare the distribution of colony counts adjusting to the weaning diets used in the study.

Both weaning diets exhibited increasing counts of colony. The population of pectinolytic, proteolytic and amylolytic functional bacteria were all rising.

Also, the isolated bacteria were found to acquire multifunctional bacterial properties, which are necessary to convert and absorb feed nutrients and provide calves their needed energy.

The high fiber content of Pakchong 1' and high protein content of colostrum and calf starter, together with the minimum content of moisture, ash, and fat, promote the gradual growth of functional bacteria as the calves feeding consumption increases.

Statistically analyzed, results showed that there was no significant difference between the control group and treatment group of weaning diets. This implied that functional bacterial population increasingly changed due to early weaning diets with and without calf starter. It indicated that the adaptation and adjustment of ruminal bacterial population took place.

Gradual increase in the functional bacterial population played an important role in the rumen development which resulted in the attainment of the calves' full performance and productivity.

The researchers recommend further studies in order to obtain conclusive data. They suggested that the number of experimental calves be increased, feeding and sampling period be prolonged up to 90 days and anatomical and histological studies of the digestive system as influenced by weaning diets be evaluated.

The researchers were Cristy A. Singh, Khristina J. Cruz, Cynthia C. Divina, Viña Kristina D. Serrano, Perla Florendo, Daniel L. Aquino. They initiated the study in August 2016 and completed it last April.



Early introduction of weaning diets, with or without calf starter, was found to promote early development of rumen in calves.

## OPINION



# Towards the fulfillment of our tasks

**ANNABELLE S. SARABIA, PhD**  
*PCC National R4D Coordinator*

The Research and Development Division (RDD) is one of the organic divisions of the Philippine Carabao Center (PCC). It was created under the rationalization plan in 2013. Prior to the rationalization, the agency had four divisions under the Office of the Executive Director namely, Accounting and Finance Division, Planning and Special Projects Division, Program Monitoring and Evaluation Division, and Information and Training Division.

The PCC's organizational structure was operationalized thus, the defined functions of the various divisions were actualized. The task of the RDD is to conduct biotechnology and carabao researches in the fields of reproduction and physiology, genomics and bioinformatics, production systems and nutrition, carabao enterprise development, and socio-economics and policy research.

Currently, the division has seven sections. These are the Reproduction and Physiology, Animal Breeding and Genomics, Biosafety and Environment, Carabao Enterprise Development, Socio-Economics and Policy Research, and the newly added Animal Genetic Resources Section. Below are the functions of these sections and the units under them.

- Reproduction and Physiology Section covers the area of physiological system of the carabao in relation to the utilization of reproductive biotechnology.
- Animal Breeding and Genomics Section is tasked to conduct high-end biotechnology research on DNA and molecular markers to identify and characterize desirable genes in carabaos.
- Production Systems and Nutrition Section covers the development and application of biotechnologies to improve the nutritional and physiological status of the carabao.
- Biosafety and Environment Section looks into the risk reduction measures in carabao commercial establishments with focus on the development of diagnostic/test kits related to animal health and product quality.
- Carabao Enterprise Development Section handles the application of bio techniques to improve milk and meat quality. Two units are included under this section. The Central Dairy and Collection Facility handles the application of bio techniques to improve milk quality and develops carabao-based products. The Milka Krem is the marketing arm that creates demand for the developed dairy products.
- Socio-Economics and Policy Research Section covers the areas on socio-economic implications/ consequences and forecasting of production, processing, distribution and consumption of carabao. The NIZ, the unit under this section, is responsible for the development of Nueva Ecija as a showcase of viable Dairy Buffalo Enterprise project, regular evaluation and program assessment of cooperatives in the said province, implement researches toward model building of livestock enterprises, and provide technical services to PCC centers and other operating units of the agency.
- Animal Genetic Resources Section is tasked to cover the areas on the conservation and utilization of water buffalo's genetic materials. This consists of three sections namely, the National Genepool, a unit tasked to select and collect potential sires and dams from the Center Test Stations and participating accredited farms all over the country. The Cryobank Unit, on the other hand, is engaged in the characterization and safekeeping of in vitro genetic materials in the form of semen, embryos, oocytes, tissues, DNA of indigenous and selected domestic livestock species. The unit coordinates with various breeding farms, animal institutions engaged in production and in vivo conservation, animal research centers, and others in the collection of genetic materials for in vitro preservation. The Livestock Biotechnology Research and Animal Facility is based in Saranay, San Jose City in Nueva Ecija.

Each section has its distinct definitive function. These functions will, of course, be worked out by individual researchers. We always have to cautiously look back on these functions so that the researches we do are aligned with them. Let us remember that our efforts should be geared towards the realization of our goal in the Carabao Development Program.

The researches we conduct should also address issues considering the thematic areas in the Intensified Research-Based Enterprise Build-Up (iREB), our strategic shift, the R4D, in the CDP to create favorable impacts in the rural communities we serve.

Likewise, our researches have to be connected with the issues that our twelve regional centers are facing. And, while we address these issues, problems along the value chain should also be equally taken into account.

Remember that after all our efforts, works, and the amount of time we put on our researches, the bottom line is we are doing what we do for the benefit of the carabao farmers and other stakeholders along the value chain.

We need to achieve efficient production and processing, and we need to help open avenues for the market of products produced by farmers and create demand of these products for them to generate more income.

## R4D Highlights®

R4D Highlights, an annual publication of the Philippine Carabao Center, publishes in popularized form the agency's completed researches presented in its annual R&D Review. This publication reaches out to a wide scope of readers both in the science and non-science profession as well as the interested public.

For comments and suggestions, please write to the Editor-in-Chief in this mailing address:

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