Herd Health Protocols for Dromedary Camels (*Camelus dromedarius*) at Mpala Ranch and Research Centre, Laikipia County, Kenya

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This guide was made to solidify husbandry and record protocols as well as give feasible advice for common health problems in camels at the Mpala Ranch and Research Centre. For thorough reviews of camel diseases and health, see “A Field Manual of Camel Diseases” by Kohler-Rollefson and “Medicine and Surgery of Camelids” by Fowler.

Acknowledgments

Many thanks to Margaret Kinnaird and Mike Littlewood for their patience and support during our visit. Thank you to Laura Budd and Sina Mahs for their incredible help and time dedicated to the project.

Finally, a special thanks to S. Moso, Eputh, Abduraman, Adow, Abdulai, Ekomoel, and Ewoi for working and living with the camels every day. Asante sana.

--- Springer and Sharon
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Key Management Goals

Administrative

1) Maintain accurate electronic records of all camels in order to facilitate research, improve husbandry and breeding, and monitor disease

Husbandry

1) Calves drink colostrum within 2-6 hours of birth
2) <25% neonatal mortality of calves
3) Wean calves at 1 year of age
4) 1st Parity of Females no later than 6 years of age
5) No more than 2 year inter-calving period of adult females
6) <10% of herd with Body Condition Score (BCS) of 0
7) Rotate Sire at least every 3 years to prevent inbreeding

Infectious Disease

1) Keep intestinal pathogen load under control with environmental and medical interventions
2) Annual screening: Brucellosis, Q-fever, and Trypanosomosis
3) Incineration of placenta to reduce Q-fever/Brucellosis transmission to wildlife
4) Quarantine and serological screening of any new additions to herd
5) Strict personal and environmental hygiene, biohazard disposal, and quarantine of dam following any aborted fetus
6) Preventive medications: Triquin, Ivermectin
Record Keeping

Electronic and Paper Records
Entering Data into Excel Database
Excel Database Legend
Electronic and Paper Record Keeping

Electronic Records

Single excel database file with all information regarding each individual camel at Mpala. Every animal has specific ID and all information regarding that animal is recorded in a single ROW, with all events/results/data grouped in COLUMNS.

Paper Records

Sheet for Calf Data

Data entered: Date of Birth; Sex; Breed; Sire; Dam; Colostrum Intake; Iodine Application; Maternal Rejection; Branding

Calving data entered into excel database continuously; paper record written and kept in field

Monthly Herd Health Sheet

Data entered monthly: BCS, LACTATING

Data entered as event occurs: Health Issues (Mastitis, Ocular Disease), Drug administration, Laboratory results, Birth/Death

Monthly Herd Health sheets printed monthly and previous month's data entered into database
Camel Excel Database Protocol

Data Entry

1) Open Mpala excel file: DD.MM.YEAR Mpala Camel Database.xlsx
2) New Calves: Go to “INSERT ROW” and enter new row at end of Mpala or Vital herd. Enter all relevant data by column (Date of Birth; Sex; Breed; Sire; Dam; Colostrum Intake; Maternal Rejection; Active)
3) New COLUMNS: Go to “INSERT COLUMN” at appropriate section of table to insert new row.
4) Backup: Save the document to another site (email to self; thumb drive; dropbox; another hard drive)

Printing Monthly Health Sheet

1) Highlight entire database and select “DATA” then “SORT”
2) Sort by “Camel HERD ID”, then “CAMEL BRAND ID”, then “ACTIVE”. Use “ASCENDING” for all fields.
3) Highlight the Herd ID and Brand ID for all active (“1”) camels; Select “COPY” under “EDIT” menu
4) Click on “Monthly Health” Sheet, Click on A2 box under “CAMEL HERD ID”, and select “PASTE” under “EDIT” heading
5) Print Document
6) Erase changes to “Monthly Health” sheet (clicking Undo Action several times will work)
Excel Database Legend

All dates entered DAY/MONTH/YEAR

Herd ID: M (Mpala Herd) V (Vital Milk Herd)
Eartag ID: Number only
Brand ID: Number only
Active: 1 (Alive; in herd); 0 (Not in herd; Dead/Sold)
Sire (Male): M or V and Brand ID
Dam (Female): M or V and Brand ID
Breed: T (Turkana); S (Somali); P (Pakastani)
Birth: Day/Month/Year
Death/Sold: Day/Month/Year
Cause of Death: Assumed cause; Unknown is ok entry
Colostrum 2-6 hours: 1 (received colostrum); 0 (did not receive colostrum)
Maternal Rejection: 1 (Rejected by mother); 0 (not rejected by mother)
BCS: 0 (Emaciated/Thin); 1 (Normal); 2 (Obese)
Lactating: 1 (Lactating); 0 (Not lactating)

For all other fields, “1” indicates positive result or treatment given, “0” indicates negative result or treatment not given
Husbandry

Calf Care
Maternal Rejection
Dam Care
Branding and Identification
Weight Estimates/Body Condition Scoring
Milking Schedule and Boma Rotation
Calf Care

At Birth:

1) Ensure Breathing: Wipe out mucus in nose with fingers

2) Apply IODINE onto UMBILICUS

Colostrum:

THE CALF WILL VERY LIKELY DIE IF IT DOES NOT DRINK COLOSTRUM IN THE FIRST 6 HOURS OF LIFE

By 2 Hours: If calf has not stood up and suckled, pick it up to assist it to suckle.

If not suckling with assistance:

Hand milk dam, bottle feed calf

Calf should be bottle-fed every 3-4 hours for first week of life (day AND night), while trying to have calf suckle dam BEFORE bottle feeding

No Milk Letdown by Dam:

Give 25 UNITS of OXYTOCIN INTO MUSCLE ONCE, massage udder to encourage milk letdown. Bottle feed calf other camels’ milk if dam does not have milk.

HATARI!!!! (DANGER) Oxytocin can induce abortion in pregnant animals (HUMANS INCLUDED). This drug should NOT be handled by anyone who is or may be pregnant.
Maternal Rejection

Maternal rejection (the mother not accepting the calf) involves the mother not allowing the calf to drink. This is common especially with **first parity females** (females having their first calf). All first parity females should be carefully monitored for acceptance of the calf.

The calf should be drinking every 3-4 hours during first week of life.

Restraint of dam using hobbles or ties is indicated while calf is encouraged to suckle.

Physical punishment of dam will cause a negative association of the calf by the dam, and is NOT indicated.

Hobbling of dam to allow calf to suckle. Calf was bottle fed while working with dam. Dam accepted calf two days after birth.
Maternal Care

Afterbirth (Placenta): Entire placenta should be evacuated by female no later than **6 hours after birth**. If this does not occur give 25 UNITS OF OXYTOCIN into the MUSCLE (do NOT repeat dosage if already given earlier for milk letdown – i.e., only one oxytocin injection per female). Monitor mother for evacuation of placenta.

![Placenta Image]

**BURN PLACENTA IN FIRE, DO NOT DISCARD INTO BUSH**

Lochia (Normal Vaginal Discharge): Normal discharge lasts for 4-6 days after birth. Normal discharge usually has clear liquid and some blood present.

Metritis [uterus infection]: White/Green/Black foul smelling discharge

**Treatment**: Betamox LA (Amoxicillin); 1 injection into the muscle followed by another injection 2 days later.
Branding and Identification

Calves

1) 2 Ear tags (both ears) within the first week of life
   Herd ID w/ number
   i. Review Records for next number to be used
2) Brand at Weaning or greater than 8 months of age

Adults

Mpala Herd
K2 on rump or neck
Number: On RIGHT RUMP

Vital Milk Herd
VM on neck or STR on rump
Number: On LEFT NECK or LEFT RUMP
Weight Estimates and Body Condition Score

**Weight Estimates**

At Birth: 40kg
3 months: 100kg
1 year: 200kg
3 year: 350kg
Mature Adult Female
   Turkana 550kg
   Somali 650kg
Mature Adult Male: 650-700 kg
Rough Calculation: 50 x Withers (meters) x Hump (meters) x Chest (meters)

**Body Condition Scoring**

0: Emaciated (Very thin)
   Ribs visible
   Sides of spine visible
1: Normal
2: Overweight

<table>
<thead>
<tr>
<th>BCS: 0</th>
<th>BCS: 1</th>
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<tr>
<td>Emaciated</td>
<td>Normal</td>
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Milking Schedule and Pasture Management

Milking

Do not milk dam for 1 month after birth of calf (calf gets to suckle all the milk!)

Camels should be milked at least twice daily 1 month after calf is born

Milking should be completed by 8AM to allow sufficient time for camels to graze during the day

Hygiene: All milking staff will disinfect hands with alcohol gel sanitizer before starting milking

Pasture Management

Weekly: Rake boma to remove feces
  Decreases intestinal parasite load; increases hygiene

Every 1-2 months: Relocate camel boma to new location to avoid overgrazing of environment

Relocate camel boma immediately following any abortion
Veterinary Care

Preventive Veterinary Health Care

Diagnostics

Abortion

Skin Wounds

Abscess Treatment

Eye Problems

Mastitis

Diseases of Special Concern: Brucellosis, Q-Fever, Surra

Veterinary Drugs and Drug Dosages
Preventive Veterinary Health Care

Ivermectin INJECTED UNDER SKIN; BY MOUTH
   1-2 times a year
   Treats: Internal parasites (worms), mange, lice
   Other dewormers: Fenbendazole, Pyrantel
Triquin (Quinapyramine sulphate/chloride) INJECTED UNDER SKIN
   TWICE A YEAR
   Preventative/Curative Treatment for Surra
       (Trypanosoma evansii)
Vaccinations: No prophylactic vaccines currently recommended for Mpala Ranch, but the following could be used:
   “Blanthrax” (Black Leg/Anthrax)
   Tetanus Toxoid
   Rabies vaccination
Brucella: Modified Live vaccines (NOT recommended at this time for camels)
Diagnostics

Blood Sampling

Sampling: Take blood from jugular vein using a syringe or vacutainer and an 18-20 gauge needle

EDTA (purple top with anticoagulant): Prevents blood clotting, after centrifugation clear fluid is plasma

Serum Separator (red top without anticoagulant): Assists blood clotting, after centrifugation clear fluid is serum

Centrifugation: Spin blood samples for 10 minutes

Storage: Pour off plasma or serum into separate container (such as cryotube), and store in freezer or refrigerator until sample is used

Fecal Samples

Take 3g of fresh fecal sample

Mix into Fecalyser with Salt Water solution, fill to top

Place cover slip on top of fluid and leave for 20 minutes

Examine cover slip under microscope (10x or 40x)

Trypanosome Screening

Use EDTA blood (not spun) or whole blood (while in field) to make blood smear on glass slide

Let slide dry; Use Diff-Quik staining. Examine under microscope (40x then 100x w/ oil for ID)
Abortion

1) CONTACT MARGARET AND/OR MIKE IMMEDIATELY!!!

2) Isolate Mother Away from Other Camels (for at least 1-2 weeks)

3) Record Brand and ID of Mother on Health Sheet

4) Record Aborted Fetus as NEW CALF w/ new ID (record herd/brand/dam/sire/date of abortion)

5) Wear Mask and Gloves (REQUIRED!!!)

6) Take Diagnostic Samples (with proper protection = gloves and face mask)
   
   Mother: Blood samples (EDTA and Serum Separator)
   Fetus: Abomasal fluid (place in sterile container)
   Placenta: Cut portion (place in sterile container)

7) BURN FETUS AND PLACENTA AT A DISTANCE OF GREATER THAN 100 METERS

8) Relocate Herd to new Boma

Laboratory Requests

Dam blood: Brucella (serology), Q-Fever (serology), Trypanosome (serology/direct smear)

Fetus/Placenta: Histology, Culture, PCR

HATARI (WARNING): There are many reasons a camel may abort, but some diseases (such as Q-Fever and Brucellosis) can cause serious sickness and abortion in humans. Pregnant, young, elderly, and/or immunocompromised (HIV positive) people should NOT be in contact with the mother or fetus.
Skin Wounds

Carnivore/Oxpecker wounds
Camel Pox
Ringworm
Ruptured Abscess

Treatment:
Iodine Spray Bottle:
Spray on wound ONCE A DAY for ONE WEEK

Refilling 1L Spray Bottle:
12ml Iodine Tincture
Fill Bottle with CLEAN DRINKING WATER

Betamox LA (Amoxicillin) (2 injections into muscle, 2 days apart) is acceptable if wound is severe, patient is not eating, and required for ALL carnivore bites
Abscess Treatment

1) **Identify**: Abscess can be hard (if chronic) or soft (if early stages) and warm. Press around abscess to identify SOFTEST area.

2) **Aspirate**: Take a sterile needle and syringe, insert into abscess, and draw back on syringe. A small amount of white/yellow material with or without blood is characteristic of an abscess.

3) **Clean** outside of abscess: Spray alcohol and wipe with clean cloth or paper towel to remove dirt. Then spray Iodine on abscess and leave for AT LEAST ONE MINUTE.

4) **Lance**: Take a sterile scalpel blade and cut into the LOWEST (near the ground) and SOFTEST portion of the abscess.

5) **Clean**: Fill a bucket with clean drinking water and add Iodine tincture into water until color of weak tea. Take syringe and FLUSH out inside of abscess with dilute iodine water until there is not more material. You may have to press against the abscess from the outside to help remove material inside.

6) **Antibiotic**: Give two injections (one immediately and one in two days) of Betamox LA (Amoxicillin) into the muscle to help prevent a secondary infection from the procedure.

7) **Monitor**: Look at area daily. Foul smells or green/black discharge are abnormal; small amounts of clear fluid or blood are normal for the first few days.
Mastitis

Clinical Signs of Mastitis

Evaluate milk: clots, blood, watery
Evaluate udder: hard, hot
Evaluate whole animal: anorexia (not eating), not ruminating (chewing)

Treatment/Management:

1) Give Betamox LA (Amoxicillin) into muscle once and repeat in 2 days
2) Milk out infected teat (or teats) completely three times a day for 1 week; DISCARD MILK ONTO GROUND AND DO NOT DRINK
3) Milk Mastitis camel LAST to prevent spread of bacteria to other camels
4) Use Alcohol Gel to Wash hands BEFORE and AFTER handling infected udder
Eye Disease (Conjunctivitis and Corneal Ulcers)

Early stages of healing corneal ulcer

Conjunctivitis: inflammation of inner lining of eyelid

7 days post-treatment w/ serum and IM antibiotics (small healed corneal scar still visible)

Treatment

Antibiotics

Opticlox Eye Ointment (Cloxacillin): Apply strip of ointment into effected eye ONE TIME by pulling down lower eyelid and squeezing ointment onto conjunctiva (this is safer than trying to apply directly onto cornea or surface of eye). Repeat in 2 DAYS if necessary.

OR

Oxytetracycline LA (Alamycin): Give 2 injections (two days apart) into the Muscle. Oxytetracycline antibiotic will be secreted in tears.

Serum (For Severe Ulcers):

Fill up 3 Serum Separator tubes with blood from the jugular vein. Use a centrifuge to spin for 10 minutes. Pour serum off into a clean sterile syringe and keep cold (refrigerator or ice pack in cooler). Apply 1-2ml serum into the affected eye TWO TO THREE TIMES A DAY FOR 5-7 days.
Diseases of Special Concern for Mpala Camels

Brucellosis (*Brucella abortus, Brucella melitensis*)

Brucellosis is a zoonotic (transfers between animals and humans) disease. *Brucella spp.* are gram-negative intracellular bacteria that are mainly spread between animals following contact with placenta, fetus, or vaginal discharges during abortions or normal parturition (birth). In animals, brucellosis is mainly an economic problem that leads to abortions and deaths of neonatal animals, but rarely has any effect on adult animals during further pregnancies. Infected animals can become chronic shedders of the bacteria even though they do not appear sick, and shed bacteria both during birth of calves and in their milk.

Humans become infected by exposure to fluids and tissues during birth of calves, or drinking of unpasteurized milk. The clinical signs include flu-like symptoms (fever, headache, muscle pain) but some cases lead to infections in the heart, arthritis, abortion, and chronic sickness. Human to human transmission occurs only in extreme cases (bone marrow transplantation).

Blood tests demonstrate that the Mpala camels have been exposed to brucellosis and may be a source of infection to humans through unpasteurized milk and to secretions during birth or abortion.

**Management Strategy:**

At this point in time, Mpala Ranch will test all camels yearly for brucellosis via the *Rose Bengal Test* and confirm positive reactors with the *Complement Fixation Test*. All positive animals will be culled. Other management strategies include testing and isolation of all additions to the camel herd, testing of any dam who aborts along with analysis of the aborted fetus, and proper disposal (incineration) of placenta.

At this point in time, the use of any vaccination using live--modified vaccines (REV1 or STR 19) is **not** recommended due to the lack of evidence for its use in camels, the possibility of human infection if inadvertently injected with the vaccine, as well as the very low herd prevalence of Brucellosis in the camel herd.
Diseases of Special Concern for Mpala Camels

Q-Fever (*Coxiella burnetii*)

Q-fever is a zoonotic (transfers between animals and humans) disease. *Coxiella burnetii* is mainly spread between animals at parturition (birth) by inhalation or direct contact with fluids and tissues. Ticks may be important for Q-fever transmission among wildlife, but their role in camel or human transmission is uncertain. *Coxiella burnetii* forms spore-like structures that are resistant to environmental conditions and remain infectious for up to a year after being excreted. Q-fever infection and transmission to humans is traditionally associated with sheep and goats, but camels, cats, dogs, rabbits, birds, and reptiles have all shown evidence of exposure and immune response.

Humans are most frequently infected when the infected animal gives birth via aerosols, but unpasteurized milk can also be a source of infection. Clinical signs include flu-like symptoms (fever, headache), pneumonia, hepatitis, endocarditis (heart infection), and abortion. Person to person transmission is extremely rare.

Blood tests measuring antibodies have found that a proportion of the Mpala camels have been exposed to Q-Fever, and may be a source of infection for humans, other livestock, and wildlife.

**Management Strategy**

At this point in time, Mpala Ranch will test all camels yearly for Q-Fever using an ELISA test kit via the Central Veterinary Laboratory. Due to the high prevalence of Q-Fever in the herd and lack of evidence the camels are actively spreading the pathogen, culling of camels that have been exposed and had an immune response to Q-Fever may not be indicated. There is no commercially available vaccine for Q-Fever at this time. Incineration of placenta and protocols following abortions will help decrease the transmission of Q-Fever among the camels if it is occurring.

There is a strong research interest in Q-Fever in camels; therefore the yearly data will prove invaluable for future understanding of camels and their role in Q-Fever transmission between humans, livestock, and wildlife.
Diseases of Special Concern for Mpala Camels

Surra (Trypanosoma evansi)

Surra is NOT a zoonotic disease. There are other trypanosome diseases caused by other species of Trypanosoma (Chagas disease, sleeping sickness) that may be zoonotic, affect other livestock, or have a life cycle linked to TseTse flies, and Surra should not be confused with these diseases.

Surra is caused by a protozoal parasite in the camel’s blood. The parasite is transferred from camel by biting insects (mainly Tabanid or “Horse Fly” flies), which acts as a mechanical vector. The flies are most infective up to 8 minutes after biting an infected animal, and by 8 hours are no longer infective. Reusing needles between animals can also lead to disease transmission.

Infections in animals can be mild or severe, and outbreaks can lead to one--quarter to half the herd being affected. Some animals may die suddenly, while others will develop a chronic condition characterized by weight loss, lethargy, anemia (low red blood cell volume), and edema (increase of water outside blood vessels which leads to “bloated” appearance).

Diagnosis of Surra is made via clinical signs mentioned above, low packed cell volume (PCV) (measured via taking a jugular blood sample into an EDTA tube, placing the blood in a capillary tube, spinning it for 5 minutes, and measuring the PCV on a measuring card) usually less than 15%, and microscope visualization of the protozoa on a blood smear.

Management Strategy

At this time, the Mpala and Vital herds are free of Surra. Yearly testing of the entire herd, along with quarantine and testing of animal additions to the herd, will help identify infected animals.

At this time, Mpala will use the medication Quinapyramine chloride/sulphate (“TRIQUIN”) twice a year to both prevent and cure Surra in the camels. There is a risk of drug resistance building over time, so yearly testing should continue despite preventive treatment with this drug.