Example for feeding management plan: Meerkats

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Belo Horizonte 2019
1. Natural diet
Diet and foraging behaviour of group-living meerkats, *Suricata suricatta*, in the southern Kalahari

S. P. Doolan*1 and D. W. Macdonald
Meerkats

1. Natural diet – insectivore, with sparse vertebrate prey
2. Feeding mode – permanent searching with guards
3. Reported problems in captivity
MONGOOSE,
MEERKAT, and FOSSA
(Herpestidae/Eupleridae)
CARE MANUAL

CREATED BY THE
AZA Small Carnivore Taxon Advisory Group
IN ASSOCIATION WITH THE
AZA Animal Welfare Committee
**Meerkat:** Taurine has been determined to be a necessary component to the diet of meerkats; lack of taurine may result in enlarged hearts and related complications. Diets should contain a form of cat food (which is rich in taurine), mice (which also contain taurine), or taurine dietary supplements (K. Kimble, personal communication, 2004 & 2005). See Appendix F for nutrient descriptions and Chapter 6: Veterinary Care for additional information.
**Meerkat:** In stable groups, at least one feeding station should be provided for every three individuals. In non-stable groups, or groups in which food aggression has been observed there should be at least one feeding station for each individual in the group with feeding stations distributed in such a way that no one individual can monopolize more than one feeding station. Scattering diet items and/or multiple feeding stations are the most effective ways to feed a large group of meerkats. When offering enrichment items, there should be at least one item for each individual to prevent aggression, and items should be spread out as much as possible.

The primary part of the diet should be fed in the morning, allowing animals to eat throughout the day. Whole prey items (e.g., mice, ribs) and live bugs (mealworms and crickets) can be fed in the afternoon/early evening or at scattered enrichment times. Care should be taken when feeding whole prey that each individual receives an item, thereby minimizing opportunities for aggression (K. Kimble, personal communication, 2004 & 2005).

Initial introduction of food can stimulate aggression amongst meerkats; therefore, it is recommended that they be offered the majority of their diet once daily, in the morning. If a schedule of multiple, small feedings is adopted the provision of less food more often may stimulate unnecessary aggression leading to social unrest (K. Kimble, personal communication, 2004 & 2005).
Meerkats

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4. Do they use latrines? – they do

Latrine distribution and patterns of use by wild meerkats: implications for territory and mate defence

NEIL R. JORDAN*,†, MICHAEL I. CHERRY* & MARTA B. MANSER‡
ANIMAL BEHAVIOUR, 2007, 73, 613–622
Meerkats

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5. What diets have been described in zoos?
# Mongoose, Meerkat, and Fossa (Herpestidae/Eupleridae) Care Manual

**Institution C**
- IAMS adult cat food dry: 32 grams/day, 57.14%
- Natural Balance Carnivore 10%: 10 grams/day, 17.86%
- Fruit – used apple: 3 grams, 5.36%
- Starch – used sweet potato: 3 grams, 5.36%
- Veggies – used carrot: 7 grams, 12.50%
- Crickets: 1 gram, 1.79%
- **Total**: 56 grams, 100%

**Institution D**
- Royal Canine Vet Diet Low Fat: 15 grams/day, 43.23%
- Fruit/Vegetable – used apple/carrot: 7 grams/day, 20.17%
- Oat cereal – Cheerios: 7 grams, 20.17%
- Fuzzy (6 grams) (2x/wk): 1.7 grams, 4.90%
- Avocado: 3 grams, 8.65%
- Insects – used crickets: 1 gram, 2.88%
- **Total**: 34.7 grams, 100%

**Institution E**
- PMI Exclusive chicken dry: 8.1 grams, 7.69%
- PMI Exclusive chicken light dry: 8.1 grams, 7.69%
- Fruit – used apple: 16.1 grams, 15.33%
- Carrot: 8.1 grams, 7.69%
- Yam: 8.1 grams, 7.69%
- Natural Balance Carnivore 10%: 32.4 grams, 30.72%
- Mice: 13.7 grams, 13.00%
- Egg, hard-boiled: 10.7 grams, 10.16%
- **Total**: 105.3 grams, 100%

**Institution F**
- Totally Ferret, ground: 5 grams, 6.39%
- Fruit/Vegetable: 40 grams, 51.16%
- Mealworms: 11 grams, 14.07%
- Mouse: 4.7 grams, 6.03%
- Egg, hard-boiled: 14.3 grams, 18.27%
- Ground Meat – beef: 2.8 grams, 3.65%
- Calcium carbonate: 0.33 grams, 0.42%
- **Total**: 78.13 grams, 100%

**Institution G**
- IAMS less active cat dry: 20 grams/day, 29.23%
- ZuPreem Feline canned: 10 grams/day, 14.61%
- Fruit – used apple: 8 grams, 11.69%
- Root vegetable – sweet potato: 20 grams, 29.23%
- Capelin: 2.3 grams, 3.34%
- Mouse: 2.1 grams, 3.13%
- Egg, hard-boiled: 4.6 grams, 6.68%
- Natural Balance Carnivore 10%: 1.1 grams, 1.67%
- Mouse, pinkie: 0.28 grams, 0.42%
- **Total**: 68.38 grams, 100%
Biochemical and Physiological Observations in Meerkats (*Suricata suricatta*) at Two Zoos During a Dietary Transition to a Diet Designed for Insectivores

Lori D. Gutzmann,¹ H. Karl Hill,² and Elizabeth A. Koutsos¹,³*

*Zoo Biology 28: 307–318 (2009)*

**TABLE 1.** Reported⁴ and measured (as fed and dry matter basis)⁵ nutrient contents of dry dog diet,⁶ dry insectivore diet,⁷ and canned exotic feline diet⁸

<table>
<thead>
<tr>
<th></th>
<th>Dog food⁹</th>
<th>Insectivore diet⁶</th>
<th>Exotic feline diet⁸</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reported</td>
<td>Measured</td>
<td>Reported</td>
</tr>
<tr>
<td></td>
<td>As fed</td>
<td>As fed</td>
<td>As fed</td>
</tr>
<tr>
<td></td>
<td>DMB⁶</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude protein (% min)</td>
<td>21</td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td>Crude fat (% min)</td>
<td>10</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Crude Fiber (% max)</td>
<td>4</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Ash (% max)</td>
<td>—</td>
<td>6.1</td>
<td>8.0</td>
</tr>
<tr>
<td>Taurine (%)</td>
<td>0.30</td>
<td>0.33</td>
<td>0.26</td>
</tr>
</tbody>
</table>

⁴Guaranteed analysis from product literature.
⁵As fed, determined by University of Arkansas (Department of Poultry Science, Poultry Science Center, L-209, Fayetteville, Ark, 72701).
⁶Country Value⁷ Dog food, Schell & Kampeter, Inc., St. Thomas, MO 65076.
⁷Mazuri⁸ Insectivore, PMI Nutrition International, P.O. Box 66812, St. Louis, MO 63166-6812.
⁹Zupreem* Exotic Feline Diet, Premium Nutritional Products, Inc., Mission KS.

DMB = dry matter basis.
Meerkats

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<td>Reported</td>
</tr>
<tr>
<td></td>
<td>As fed</td>
<td>As fed DMB</td>
<td>As fed DMB</td>
</tr>
<tr>
<td>Crude protein (%)</td>
<td>21</td>
<td>22 24</td>
<td>28 30 33</td>
</tr>
<tr>
<td>Crude fat (%)</td>
<td>10</td>
<td>12 13</td>
<td>12 11 12</td>
</tr>
<tr>
<td>Crude Fiber (%)</td>
<td>4</td>
<td>16 18</td>
<td>13 23 26</td>
</tr>
<tr>
<td>Ash (%)</td>
<td>–</td>
<td>6.1 6.8</td>
<td>8.0 8.2 9.1</td>
</tr>
<tr>
<td>Taurine (%)</td>
<td>–</td>
<td>0.30 0.33</td>
<td>0.26 0.55 0.61</td>
</tr>
</tbody>
</table>

*Guaranteed analysis from product literature.

As fed, determined by University of Arkansas (Department of Poultry Science, Poultry Science Center, L-209, Fayetteville, Ark, 72701).

Country Value® Dog food, Schell & Kampeter, Inc., St. Thomas, MO 65076.

Mazuri® Insectivore, PMI Nutrition International, P.O. Box 66812, St. Louis, MO 63166-6812.

Zupreem® Exotic Feline Diet, Premium Nutritional Products, Inc., Mission KS.

DMB = dry matter basis.

Does the diet exist in granulated form?
Mazuri® Insectivore Diet
(Available at www.mazuri.com or through a Mazuri® retailer)
Formula Code – 5MK8 / 5MM3 / 5M2A

Description
Mazuri® Insectivore Diet is designed to simulate the high protein, high fiber diet of insectivorous animals. It has been tested in a wide range of mammals, birds, reptiles and amphibians as a replacement for all or some of the insect component of the diet. The meal form may be fed via gavage when deemed appropriate under direction of a veterinarian.

Features and Benefits
• Designed to be complete and balanced for insectivores - No supplementation necessary.
• Highly fortified - May be fed with fruits, greens, etc.
• Contains fish oil - Rich source of long-chain omega-3 fatty acids.
• Contains lecithin - Rich source of phospholipids.
• Contains high fiber - Helps simulate the chitin component of the insectivore’s diet.
• Contains pigments - For healthy feather pigmentation.
• Contains taurine - At levels that meet recommendations for carnivores.
• Contains natural vitamin E and stabilized vitamin C.
• Highly palatable.

Product Form
Extruded feed: ¼” round particle.
• 5MM3 - 3 lb. paper sack
• 5MK8 - 25 lb. net weight paper sack
5M2A - Meal.
• 1 kg canister
• 3 lb. paper sack
• 5 lb. bagged
• 12 Supplement, Folic Acid, Citric Acid, "28.0%

Guaranteed Analysis
Crude protein not less than ........................................ 28.0%
Crude fat not less than ............................................... 12.0%
Crude fiber not more than ......................................... 8.0%
Moisture not more than .......................................... 12.0%
Ash not more than ..................................................... 8.0%

Ingredients
Poultry By-Product Meal, Ground Soybean Hulls, Whole Wheat, Chicken Meal, Dried Beet Pulp, Ground Brown Rice, Dried Dehulled Soybean Meal, Dried Egg Product, Ground Aspen, Poultry Fat Preserved with BHA, Porcine Animal Fat Preserved with BHA and Citric Acid, Natural Poultry Flavor, Powdered Cellulose, Dried Apple Pomace, Wheat Germ, Fish Meal, Shrimp Meal, Whey, Lecithin, Soybean Oil, Brewers Dried Yeast, Fish Oil, Phosphoric Acid, DL-Methionine, Taurine, Choline Chloride, LAscorbyl-2-Polyphosphate (Stabilized Vitamin C), Pyridoxine Hydrochloride, Salt, Thiamine Mononitrate, Menadione Sodium Bisulfite Complex (source of Vitamin K), D-Alpha Tocopheryl Acetate (Form of Vitamin E), Cholecalciferol, Preserved with Mixed Tocopherols (Form of Vitamin E), Calcium Carbonate, Biotin, Inositol, Rosemary Extract, Vitamin A Acetate, Vitamin B-12 Supplement, Folic Acid, Citric Acid, Riboflavin, Calcium Pantothenate, Nicotinic Acid, Canthaxanthin (color), Ferrous Sulfate, Calcium Iodate, Copper Sulfate, Zinc Oxide, Manganese Oxide, Ferric Carbonate, Zinc Sulfate, Sodium Selenite, Cobalt Carbonate.

Feeding Directions
• Feed to insectivores at a rate of at least 50% of their daily dry matter intake. Feed intake will vary based on animal body size and life stage, level of activity and environmental temperature.
  1. Initially, soaking the extruded Mazuri® Insectivore Diet (5MK8/5MM3) in water (2 parts water:1 part dry diet) may help to transition animals that are used to soft/moist diets.
  2. After 1-2 weeks on soaked diet, move to 1 part water: 1 part dry diet, and 1-2 weeks later, offer dry diet.
    • If moistened, replace diet twice a day.
• Prepared Mazuri® Insectivore Diet - Meal (5M2A) should be fed out as directed by your veterinarian. Never feed dry powder without first combining with water.
  1. Combine with hot water; adjust mixture to meet desired texture and need.
  2. Mix thoroughly with a spoon, fork or whisk until consistency is uniform, and administer as directed by your veterinarian.
• If feeding live insects to the animal, ensure the insects are gut loaded prior to feeding out.

THIS DIET MAY CONTAIN EXCESSIVE IRON FOR SPECIES THAT ARE SUSCEPTIBLE TO IRON STORAGE DISEASE, LIKE HORNBIILS.
Approximate Nutrient Composition

<table>
<thead>
<tr>
<th>NUTRIENTS</th>
<th>MINERALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein, %</td>
<td>Ash, % 7.1</td>
</tr>
<tr>
<td>Arginine, %</td>
<td>Calcium, % 1.38</td>
</tr>
<tr>
<td>Cystine, %</td>
<td>Phosphorus, % 0.99</td>
</tr>
<tr>
<td>Histidine, %</td>
<td>Phosphorus (non-phyate), % 0.82</td>
</tr>
<tr>
<td>Isoleucine, %</td>
<td>Potassium, % 0.68</td>
</tr>
<tr>
<td>Leucine, %</td>
<td>Magnesium, % 0.16</td>
</tr>
<tr>
<td>Lysine, %</td>
<td>Sodium, % 0.30</td>
</tr>
<tr>
<td>Methionine, %</td>
<td>Chloride, % 0.42</td>
</tr>
<tr>
<td>Phenylalanine, %</td>
<td>Sulfur, % 0.35</td>
</tr>
<tr>
<td>Tyrosine, %</td>
<td>Iron, ppm 377</td>
</tr>
<tr>
<td>Threonine, %</td>
<td>Zinc, ppm 115</td>
</tr>
<tr>
<td>Tryptophan, %</td>
<td>Manganese, ppm 77</td>
</tr>
<tr>
<td>Valine, %</td>
<td>Copper, ppm 0.24</td>
</tr>
<tr>
<td>Taurine, %</td>
<td>Iodine, ppm 2.52</td>
</tr>
<tr>
<td>Fat (Acid hydrolysis), %</td>
<td>Selenium (added), ppm 0.20</td>
</tr>
<tr>
<td>Linoleic acid, %</td>
<td>Thiamin, ppm 0.78</td>
</tr>
<tr>
<td>Linolenic acid, %</td>
<td>Riboflavin, ppm 0.24</td>
</tr>
<tr>
<td>Arachidonic acid, %</td>
<td>Niacin, ppm 0.20</td>
</tr>
<tr>
<td>Omega-3 Fatty Acids, %</td>
<td>Phosphorus, % 0.17</td>
</tr>
<tr>
<td>Omega-6 Fatty Acids, %</td>
<td>Calcium, % 0.30</td>
</tr>
<tr>
<td>Fiber (Crude), %</td>
<td>Ash, % 3.080</td>
</tr>
<tr>
<td>Neutral Detergent Fiber, %</td>
<td>Choline, ppm 2.637</td>
</tr>
<tr>
<td>Acid Detergent Fiber, %</td>
<td>Folic acid, ppm 4.3</td>
</tr>
<tr>
<td>Starch, %</td>
<td>Pyridoxine, ppm 1.4</td>
</tr>
<tr>
<td>Metabolizable Energy, kcal/kg</td>
<td>Biotin, ppm 0.55</td>
</tr>
<tr>
<td>Storage Conditions</td>
<td></td>
</tr>
</tbody>
</table>

For best results, tightly affix lid on canister after removal of desired dosage or store contents of open bag in container with sealing lid. Store in a cool (75°F or colder), dry (approximately 50% RH) location. Freezing will not harm the diet and may extend freshness. Use within 1 year of bag manufacturing.

1 Based on the latest ingredient analysis information. Since nutrient composition of ingredients varies, analyses will vary accordingly.

2 Calculated using modified Atwater, factors of 3.5 kcal/g protein, 8.5 kcal/g fat, 3.5 kcal/g carbohydrate (NRC of Dogs & Cats, 2006).

Mazuri® is a registered trademark of Purina Mills, LLC.
Meerkats

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2. Feeding mode – permanent searching with guards
3. Reported problems in captivity – taurine deficiency, aggression in relation to feeding, obesity
4. Do they use latrines? – they do
5. What diets have been described in zoos? – granulated insectivore diet
6. Can the diet be scattered automatically?
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6. Can the diet be scattered automatically? - yes
7. Concept:
   - granulated insectivore diet as main food
   - scattered up to 16 x per day over sandy areas
   - live insects daily (no need for supplementation), no mealworms but cockroaches or adult crickets
   - 1x/week vertebrate prey (1 mouse/day chick cut into pieces for 5 meerkats)
   - additionally some vegetables (beets, carrots), finely cut, for high-water, lower-energy enrichment
Meerkats

Calculations:

body mass ~ 850 g
maintenance requirement ~ 1.5 * mammal BMR ~ 440 kJ ME /animal /d

Insectivore granulated food ~ 22 g / animal / d
Live insects ~ 4 g /animal /d (= 7 crickets or 2 cockroaches)
Vegetables ~ 16 g /animal /d
1 mouse or daychick /5 animals /week not included in calculation

Monitor body condition and adjust as required.

Husbandry:

Drinking water available at all times.
Sift sandy areas regularly to avoid accumulation of organic material.
Red light hotspots at different locations than scatter-feeding areas.
Other enrichment: find ways to foster guarding behavior; use snake skins from reptile house; test (in summer) if dung (e.g. elephants) attracts insects for meerkats
Meerkats