

# NUTRITION, HEALTH AND SANITATION STANDARDS USED AT THE INTERNATIONAL CENTER FOR GIBBON STUDIES WHICH COULD BE APPLIED AT A JAVAN GIBBON RESCUE

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## HEALTH AND SANITATION

We practice strict health and sanitation procedures to prevent disease transmission. All primates new to International Center for Gibbon Studies (ICGS) must enter our primate quarantine station licensed by Center for Disease Control (CDC) for a minimum of 33 days. All primates that are imported into the US must be housed in squeeze cages during their quarantine period. During this quarantine period, feces are examined twice for ova, parasites and bacteria. A complete blood are tested, 15 days apart, for tuberculosis (TB) with (Cooper's Tuberculin Mammalian, Human Isolates Intradermic) and must have three consecutive negative results. Once the gibbon's results prove they are in good health they are housed outdoors. All test are performed approximately once a year to insure they good health. Tetanus vaccinations are given every seven years.

Prior to entering the Center, visitors must disinfect the soles of their shoes with phenolic/quaternary disinfectant spray (Staphene). ICGS does not permit visitor's who are ill, or who have been recently exposed to anyone who was sick (e.g., flues, measles, etc.) enter the property. Visitors must stay at least 2 m away from enclosures. Strict procedures have been instituted at ICGS to help prevent the spread of herpes simplex virus infection and any other zoonotic diseases between gibbons. Personnels wear protective clothing when inside the gibbon enclosures. Each enclosure has its own cleaning equipment, and disposable gloves disinfected with foamed hand ethanoled degermer (Alcare) are worn during feeding and cleaning (Mootnick, *et al.*, 1988). (Staphene) is sprayed on the soles of the rubber boots before entering and when exiting an enclosure.

We have housed 61 adult gibbons in various size REC squeeze cages, each for approximately a 30 day period, due to either they required medical care or were newly acquired. Three of the 28 adult males that we have housed in the REC LC-1,104 (interior dimensions 74x89x117 cm high) had difficulties, (e.g., depression, self mutilation on the biceps). The majority of gibbons that

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we have housed in REC cages did not drink from the sipper tube. We offer them water in apoplycarbonate bowl inside their cage. The LC-1104 uses a squeeze-back mechanism which is activated by a 60:1 ratio gear box and takes 10 seconds to crank the squeeze mechanism from the back of the cage to the front. All REC squeeze cages gave a guillotine door. The LC-1441-A (LC-1502) (interior dimensions 100x145x164 cm high) and the LC-1503 (LC-1451) (interior dimensions 100x156x160 cm high) are ideal in size but require 120 seconds to crank the squeeze mechanism from back of the cage to the front, since the mechanism works on a dual drive screw and timing belt. To facilitate cranking, we pre-wet the outside of our exam gloves to prevent them from twisting around the crank handle. In addition, due to the 100 cm width of this cage the building that this cage would be used in would need to have at least a 122 cm wide door way. We recently obtained two LC-1302 (LC-1431) (interior dimensions 81x107x140 cm high) which are somewhat similar in dimensions to the LC-1106 (LC-1421) (interior dimensions 81x101x140 cm high) except the LC-1320 uses the dual drive screw. We have not had the opportunity to use the LC-1302, but it could be an ideal minimum size in which to house adult gibbons for up to 30 days if a minimum of a 122 cm wide door way is not available at the institution.

## NUTRITION

ICGS gibbons are fed four times a day, including nutritional supplements. Diet varies with each species, season and the individual gibbon (Table 1). All food is properly inspected and washed to ensure quality. Food is placed in the enclosure in a 25 L container 1 m above the ground.

Table 1. Averaged daily intake of food given to each adult species of gibbon housed at the International Center for Gibbon Study

7:00 AM Feed	Agile gibbon	Moloch gibbon	Pileated gibbon	Cheeked- gibbon	Siamang
Monkey chow	45 g	30 g	52.2 g	52.2 g	60 g
Red apples	131.25 g	131.25 g	175 g	175 g	262.5 g
Yellow apples	100 g	100 g	100 g	150 g	100 g

Table 1. (Cont.)

10.30 AM Feed	Agile gibbon	Moloch gibbon	Pileated gibbon	Checked- gibbon	Siamang
Greens beans	20 g	10 g	10 g	20 g	40 g
Spinach	60 g	40 g	20 g	60 g	60 g
Carrots	20 g	30 g	40 g	20 g	40 g
Broccoli	10 g	10 g	10 g	10 g	10 g
Yam	80 g	80 g	80 g	80 g	100 g
Kiwi	20 g	20 g	20 g	20 g	20 g
Kale	15 g	15 g	15 g	30 g	30 g
Celery	30 g	30 g	60 g	30 g	45 g
Greens	90 g	45 g	30 g	60 g	130 g
Red apples	87.5 g	87.5 g	87.5 g	131.25 g	131.25 g
Yellows apples	50 g	50 g	50 g	50 g	50 g
Bananas	280 g	350 g	420 g	420 g	350 g
Greens	30 g	15 g	30 g	45 g	45 g

The daily food intake of ICGS gibbons are recorded which indicates their behavioral and physical condition. A stool analysis and behavioral observations are conducted on gibbons that exhibit appetite loss of more than 2 day duration. Various physiological, psychological or environmental factors can lead to appetite loss. Nutritious foods that the gibbons prefer and that do not upset their digestive system are offered to stimulate their interest in eating (Mootnick, Haimoff, & Nyunt-Lwin, 1987). A complete medical examination, including blood work, may be warranted if loss of appetite persists and stool and observational examinations are inconclusive.

#### NUTRITIONAL ENRICHMENT

For enrichment purposes and to help stimulate foraging behavior, greens are placed on top of the secondary enclosure. The gibbons' diet is varied each week; *i.e.* romaine, escarole, and endive are alternated weekly and occasionally

substituted with arugala, radicchio, mustard greens, Swiss chard, collards, or dandelions; Green beans are alternated with snap peas and China peas; green kale is alternated with purple or white kale; broccoli is alternated with cauliflower and broccoflower; spinach is alternated with mizumi spinach; yams are alternated with sweet potatoes; gold Delicious apples are alternated with Pippin; and Granny Smith apples and red Delicious apples are alternated with Braeburn, Macintosh, Fuji, and Gala apples; bananas are occasionally substituted with either macho or apple bananas. Because of gibbons' sensitivity digestive system and inability to cope with fruits may result in severe physiological reactions (e.g. swollen eyes, diarrhea, etc.) We feed the gibbons kiwi, broccoli, papaya, bell pepper, and cantaloupe as a source of vitamin C instead of using citrus. Vitamin C derived from rose hips and acerola is also given through multi-vitamins. Carrots, sweet potatoes, and yams are steamed, since these foods are not readily broken down by gibbons' digestive system. Broccoli is steamed for flavor and to reduce flatulence. Figs, mangos, guavas, apple pears, cherimoyas, star fruit, passion fruit, artichoke hearts, asparagus and roses are given as treats when in season. Celery is cut into 5 cm pieces to prevent choking. Since bananas are typically fumigated with pesticides or gassed to expedite ripening, they are fed peeled (unless they are organic). Approximately one biscuit (Zu/Preem primate dry diet) is fed per 1 kg gibbon daily. Alternative sources of protein are also given to the gibbons such as raw and shelled cashews, macadamias, walnuts, pecans, Brazil nuts, almonds, pine nuts, pumpkin seeds, sunflower seeds, mealworms, grasshoppers, spiders, boiled chicken, tofu, bee pollen and hard-boiled eggs. Peanuts are avoided because they can be a source of aflatoxin which, when ingested, can contribute to liver cancer (Margen, 1992).

If a gibbon becomes constipated from not defecating during transit, ingesting substrate, or stress, we first try offering foods that cause loose stools (e.g. dried fruit, cherries, grapes, citrus, berries, and in larger quantities plums, peaches, nectarines, apricots, pears). If the gibbon does not eat or defecate within two days, we then tranquilize it and administer 150 ml enema of either mineral oil or saline solution, and 400 ml of Lactated Ringers solution subcutaneous in the scapular region.

When gibbons are reluctant to eat, we have seen success by offering a wide variety of greens, fruits, nuts, seeds, and boiled chicken, rotating the food everyday so that they do not become bored with the food source. We do not allow food to remain uneaten for more than three hours. In case their reluctance to eat is not related to constipation, it is very important to further investigate

why they are not eating. Gibbons will often refuse to take oral medication. Ideally unpalatable medicines can be compounded at a pharmacy in fruit flavors. The medication may also be disguised by being placed inside ripe fruits or mixed with jams, nut butter, molasses, honey, or three drops of fruit extract and placed on a honey nut, apple cinnamon, or banana (Hain) rice cake.

#### PRODUCTS MENTIONED IN THE TEXT

Alcare: a surgical scrub manufactured by Calgon Vestal Laboratories, Inc., St. Louis, MO, USA. Coopers: Tuberculin Mammalian, Human Isolates Intradermic is manufactured by Coopers Animal Health Inc., Kansas City, KS, USA.

Hain: rice cake manufactured by Hain Food Group, Inc., Uniondale, NY, USA.

Rec: manufactures sturdy primate cages. Research Equipment Company, Inc. Bryn, TX, USA.

Staphene: a disinfectant manufactured by Calgon Vestal Laboratories, Inc., St. Louis, MO, USA.

Zu/Preem: primate dry diet manufactured by Premium Nutritional Products, Inc., Topeka, KS, USA.

3M 8710 respirator: Disposable dust mist make manufactured by 3M, St. Paul, MN USA.

#### REFERENCE

Margen, S. 1992: The wellness encyclopedia of food and nutrition. 1-512. Friedman, R.M. (Ed.). New York: Rebus.

Mootnick, A., Reingold, M., Holshus, H. J., Mirkovic, M. (1988): Isolation of a herpes simplex virus type 1-like agent from the brain of a mountain agile gibbon (*Hylobates agilis agilis*) with encephalitis. J. Zoo Wildl. Med.