

OTHER DOMESTICATED AND FARMED ANIMALS

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Summary

Several types of food animals which are present in the wild, are now domesticated or semi-domesticated and farmed. The longer these animals have been farmed the greater their diversity and the more they differ from their non-farmed ancestors. In spite of this deviation from the original stock, the animals' body composition is still between traditional farmed animals and the wild stock. They are usually fatter, and healthier than their non-farmed counterpart. They are also more acceptable as a food source by Western standards, than their wild ancestors. Familiarity seems to improve acceptance.

1. Introduction

Many undomesticated animals that are used for human consumption are found in the wild, farmed or raised in enclosures. Usually the farmed animals have a more adequate and constant food supply, medical attention, and therefore, on average, they are more healthy. However, confinement sometimes increases the incidence of bacterial and viral contamination. Due to a more plentiful supply of a balanced ration and less exercise, the farmed animals are faster growing, and slightly fatter than their un-farmed counterparts. However, they are still usually leaner than most domesticated meat animals. Western attitudes on consumption of undomesticated and domesticated animals that are raised in confinement are usually more favorable than the attitude for hunted exotic animals.

2. Undomesticated animals

Alligators and crocodiles are farmed in Florida, Louisiana, Australia, Thailand and probably other places, but the major portion eaten by the native populations are still caught from the wild. When farmed, they are usually kept in a large outdoor or indoor (if climate is not mild year around, e.g. 80 to 90 °F) pen (usually of concrete) with a small non-stagnant pool (to regulate body temperature and to wash down food), with a heat lamp area for basking (Gruen, 1998). The food provided consists of insects, fish, mice, rabbits, and chickens, and there is now a commercial alligator chow.

| Meat | % Moisture | % Fat | % Ash | % Protein | % Total | Nanograms/g of α - Tocopherol | Micrograms/g Riboflavin | Micrograms/g Thiamine |
|----------------------|------------|----------|-----------|------------|----------|--------------------------------------|-------------------------|-----------------------|
| Beefalo | 70.9 | 4.80 | 0.92 | 23.30 | 99.9 | | 0.09 | 0.04 |
| Bison | 74.6 | 1.84 | 1.20 | 21.62 | 99.3 | | | |
| Buffalo, water | 76.3-78.6 | 1.4-4.9 | 0.9-1.1 | 17.7-20.4 | 99.1-100 | | 0.20-0.35 | 0.04-0.06 |
| Camel | 59.1 | 20.3 | 1.0 | 19.6 | | | | |
| Dog | 60.8 | 23.5 | 1.2 | 14.5 | | | 0.8 | 0.04 |
| Duck, domesticated | 51.8 | 6-29.2 | 0.82 | 15.8 | 99.7 | | 0.22 | 0.10 |
| | 64.2 | | 1.11 | 23.48 | -100.0 | | 0.47 | 0.26 |
| Goose, domesticated | 72.4 | 7-11.2 | 0.7 | 15.4-23 | 99.7 | | | |
| Guinea | 68.9 | 6.45 | 1.25 | 23.4 | 100.0 | | 0.10 | 0.06 |
| Horse | 72.6-74.6 | 3.7-4.6 | 0.99-1.2 | 20.5-21.4 | 99.6 | | 0.10 | 0.13 |
| Ostrich, Ground | 73.4 | 1.87 | 0.38 | 19.5 | 95.1 | 0.65 | 0.69 | 1.15 |
| Ostrich, Steak | 73.8 | 0.26 | 0.50 | 20.5 | 96.5 | 0.17 | 0.86 | 0.32 |
| Rabbit, domesticated | 70.9-72.8 | 4.0-5.6 | 0.72-1.5 | 20.05-22.8 | 99.1-100 | | 0.15 | 0.10 |
| Squab, pigeon | 56.6- | 3.1-23.8 | 1.17-1.40 | 18.47- | 100.- | | 0.22 | 0.21 |
| | 72.8 | | | 34.1 | 99.0 | | | |

Source: Gade, 1976; Lakritz *et al.* 1998; Leung *et al.* 1968; Ohtsuka *et al.*, 1984; Leung *et al.*, 1972; Sabry and Rizek, 1892; USDA, 1999; USDA, 1989; USDA, 1979.

Table 1. Farmed animal raw muscle proximate analysis

Composition of crocodile tissue can be found in *Undomesticated Food Animals Hunted and Used for Food*. Many of the alligator skins are exported to France and are transformed into expensive purses.

Bison are sometimes farmed, but the great majority in the US are protected in National Parks. If farmed, a sturdy fence is required and feed consists primarily of grass and roughage. Bison tissue is leaner than cattle tissue. Composition of the meat can be found in Table 1 and in *Undomesticated Food Animals Hunted and Used for Food*.

Deer (including reindeer) meat (venison) usually comes from the wild but they are farmed in New Zealand, UK and other places. Again, a strong and high fence is required and feed is usually brought to the animals due to the expense of building a deer proof fence to surround a large pasture. Roughage is the principal food of this ruminant, but grain is also appreciated. Antlers (and antler velvet which is exported to eastern Asia for its medicinal properties) and hide are valuable by-products.

A great deal of deer meat is shipped to Germany. A notable exception to the limited farming of deer is the reindeer that are herded in northern Europe and northern Asia. These animals, that are well adapted to cold climates, are maintained in large herds by nomadic people that follow them in their grazing patterns. They are used for work, meat, milk and hides. Again the meat is lean, and the composition can be found in *Undomesticated Food Animals Hunted and Used for Food*.

Large birds (emu and ostrich) are now farmed in large numbers. The original use was for leather, feathers and eggs, and meat was a byproduct. However, today more emphasis is placed on the meat and raising them in captivity is becoming more popular. Tourism is also an extra income, producing potentially lucrative activity for the ostrich farmer.

The ostrich's off white to buff colored egg is weighs about 1400g, or approximately 1.2% of the weight of an ostrich hen. It is pitted with large pores to permit high permeability of air. The shell is strong, rendering it less susceptible to breakage during transport. The ostrich egg is equivalent to 1 to 2 dozen chicken eggs (57g each) and the yolk is a higher percentage (30-40%) of the total egg weight. Egg shell percentage (14%) is also greater for ostrich eggs than in most domestic birds. The egg is slightly lower in fat than chicken eggs. Ostrich eggs are limited in availability due to the high demand for hatching eggs. Eggs are cooked to the soft boiled stage in 45 minutes but it requires 1.5 hours to reach the hard boiled state (Sales *et al.*, 1996).

A strong fence is required to contain ostriches. Feed consists of commercial feed mashes as utilized for poultry and horses, plus clover hay. Other acceptable feeds include grazing, greens, hay and wheat.

Composition of ostrich tissue can be found in Table 1 and in *Undomesticated Food Animals Hunted and Used for Food*.

Turkeys were domesticated from the wild turkey which is native to Northern Mexico and eastern USA. Today, farmed turkeys far outnumber wild turkeys. Common

domestic breeds are Bourbon Red, Bronze, Narragansett and White Holland, each with a different growth rate and maturity size. They can be raised on litter floors (heated brooder rings are helpful) or outdoor runs (pastures should be rotated to keep down infections). It is important to keep the pens clean with fresh litter and to have good ventilation with no odor of ammonia. Also, pigs and turkeys should not be raised on the same farm since some diseases can be transmitted between these two types of animals. Turkeys normally lay between 80-100 eggs during the first 25 week cycle, and 78-80 eggs during the second cycle.

Turkeys are fed corn and soybeans supplemented with vitamins and minerals. The crude protein level of the diet is reduced (28-16%) as the animal ages. No hormones are approved and antibodies, to keep down infection, are carefully regulated. Turkeys have been bred to have meaty breast and thighs and white feathers (to reduce dark spots on the skin). In fourteen weeks a hen should weigh 15 pounds and a male in eighteen weeks should weigh 30 pounds. Turkey tissue is high in protein, low in fat, and therefore a nutritionally desirable tissue. Per capita consumption of turkeys in USA is approximately 18 pounds/year and exports amount to over 8% of total US turkey production. The cooked composition can be found in Table 2. The farmed birds are considerably fatter than those not raised in captivity, but they are still leaner than beef tissue. The composition can be found in *Undomesticated Food Animals Hunted and Used for Food*.

Pheasant and quail are both taken from the wild, but are also raised in enclosures for meat and for release in game preserves for hunting. The wild population is decreasing due to loss of habitat and the number of farmed birds is increasing. In many states a license or permit is required for confinement rearing of game birds.

Pheasant and the peafowl belong to the same order (*Galliformes*) and family (*Phasianidae*). There are many genera, species and subspecies. If pheasants are raised for meat, the birds should be selected for body weight at 6-8 weeks (sold as baby pheasants) and also for body weight at maturity. For release in game preserves, a lighter weight, good flying, well feathered pheasant is preferred. When raised in enclosures, pheasants can be started in a brooder house, utilizing chopped straw, burlap or brooder paper as litter (the latter two should be removed after 1 week). There should be at least 0.75 square feet/bird and heat lamps should be provided. Feed should contain 30% protein and should be medicated game bird starter in crumble form. After 2 to 3 weeks the chicks can range outside during the day in a covered pen which is at least 7 feet tall. The sides should be made of galvanized wire with 1 inch holes and the top should be netting. After 6 weeks the birds can be fed a 20% protein grower feed (Macfarlane, 2000).

One male can service 7 females in a breeder pen. Each hen will produce 50-60 eggs/laying season and 70% hatchability is an average (Providence of Nova Scotia, 1997). During the laying season an 18% protein commercial lay ration containing 3% calcium should be provided and insoluble grit should also be available. The composition of muscles can be found in *Undomesticated Food Animals Hunted and Used for Food*.

| Food | Method of cooking | Moisture, % | Protein,% | Fat, % | Na, mg | K, mg | Ca, mg | Mg, mg | Fe, mg | Cu, mg | P, mg | S, mg | Cl, mg |
|-------------|-----------------------|-------------|-----------|-----------|--------|-------|--------|--------|---------|--------|---------|-------|--------|
| Duck | Roast, flesh | 52.0 | 22.8-24.6 | 11.2-23.6 | 195 | 319 | 12-19 | 23.9 | 1.5-5.8 | | 175-231 | 395 | 158 |
| | Roast, flesh and skin | | 19 | 28 | | | | | | | | | |
| | Cooked, breast | | | 2.4 | | | | | | | | | |
| | Cooked, leg | | | 5.9 | | | | | | | | | |
| Goose | Roast, flesh | 46.7 | 28-28.9 | 12.7-22.4 | 145 | 406 | 10.4 | 30.8 | 4.6 | | 267 | 319 | 159 |
| | Roast, flesh and skin | | 25 | 22 | | | | | | | | | |
| Guinea-fowl | Roast, flesh | 56.9 | 32.5 | 8.2 | 136 | 430 | 19.2 | 28.7 | 9.3 | | 292 | 363 | 179 |
| Pigeon | Broiled, flesh | 62.1 | 21.7 | 13.9 | 74 | 299 | 17.6 | 31.2 | 9.8 | | 352 | 243 | 75 |
| | Roast, flesh | 57.2 | 26.8 | 13.2 | 105 | 410 | 16.3 | 33.8 | 19.4 | | 404 | 302 | 99 |
| Rabbit | Stewed, flesh | 63.9 | 15.6-26.6 | 7.7-11 | 32 | 210 | 11.3 | 21.6 | 1.9 | 0.20 | 199 | 245 | 43 |
| | Roast, flesh | | 22.8 | 6.4 | | | | | | | | | |
| Turkey | Roast, dark flesh | | 28.6 | 7.2 | | | | | | | | | |
| | Roast, basting, flesh | 59.0 | 30.2 | 7.7 | 130 | 367 | 38.3 | 28.2 | 3.6 | | 320 | 234 | 123 |

Source: Sabry and Rizek, 1982; McCance and Widdowson, 1960.

Table 2. Analysis of cooked farmed wildlife

Quail are native to both Europe and Asia, but with increased reduction in habitat, the wild birds are becoming less abundant and domestically raised game birds are increasing in popularity. In the U.S.A. the eastern subspecies of bobwhite quail is the most popular in the wild as well as in captivity. Other popular species include Florida, masked, plain, and Texas bobwhites. If birds are grown for meat, the larger varieties should be selected. For hunting, the small to moderate (6 to 7 ounces) birds is more desirable (Skewes and Wilson, 2000).

There are several types of housing for breeder quail. They include floor pens (least expensive but less desirable), colony cages, and individual cages (decrease in disease and cleaner eggs). Light stimulates the reproductive system and artificial lighting of 5 foot candles (60 watt lights at 10 foot intervals) for 17 hours/day is desirable. Temperature should be maintained at 50-85° F, and adequate ventilation is necessary. Eggs should be collected at least 3 times/day and maintained at 55-65°F with a relative humidity of 75-90% and can be held for up to 15 days. Then the eggs should be moved to room temperature for 1 to 2 hours before being placed in an incubator. Twenty three to twenty four days are required for the eggs to hatch. Incubation environment (Skewes, and Wilson, 2000) should be as shown in Table 3.

| Incubator type | Dry bulb temperature | | Wet bulb temperature | |
|----------------|----------------------|-------------|----------------------|-------------|
| | First 20 days | Last 3 days | First 20 days | Last 3 days |
| Forced air | 100.25°F | 99.25°F | 86-88°F | 90-92°F |
| Still air | 103°F | 100°F | 86-88°F | 90-92°F |

Table 3. Incubation specifications for quail

Eggs should be incubated with small end down and turned 3 times/day.

Chicks for the first week should be maintained at 100°F by using a brooder heat lamp. During the second week the temperature should be reduced to 95°F. In the 3rd through the 7th week the temperature can be reduced 5°F/week until 70°F is reached. At 6 weeks, grow-out pens (on ground or raised wire floors) and grower feed can be used (Skewes and Wilson, 2000). Maturity is usually reached at 16 weeks and the birds can be utilized for meat or for hunting. If hunting is the final purpose, then flight conditioning is desired. This requires larger flight pens and birds should have excess to these enclosures for at least 6 weeks before release.

Processing birds for meat usually occurs before the birds are six months of age. This produces a more tender tissue and facilitates the removal of feathers. After bleeding, the birds are scalded in 135 °F water. After evisceration they are chilled overnight in ice water sometimes with 5% salt added. They can be cooked fresh or frozen for consumption at a later date.

Eggs are similar to chicken eggs but smaller and contain 6-10% more yolk. They are often used as hors d'oeuvres or snacks, and pickling (e.g. dilled, red beet, spicy, sweet and sour) is common. The composition of the tissue can be found in *Undomesticated Food Animals Hunted and Used for Food*.

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Biographical Sketches

Dr. Herbert W. Ockerman is a Professor at The Ohio State University in the Meat Science Area of the Department of Animal Sciences, Columbus, Ohio, USA. He is involved in both food teaching and research and his areas of specialty include, Food Biochemistry, Food Microbiology, Statistics, and International Education. Prof. has received 26 local and national honors as well as 67 international honors from 6 continents. His publications exceed 1,650 scientific and industry focused articles, including 80+ books or chapters in books. He belongs to 24 professional societies and is listed in 56 biographical listings. He has established five International University Endowments and his hobby is shipping textbooks to his alumni around the world who are currently Secretary of Agriculture, numerous

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Lopamudra Basu is a Ph. D. Student from India in The Department of Animal Sciences, also specializing in Meat Science and International Education at the Ohio State University.