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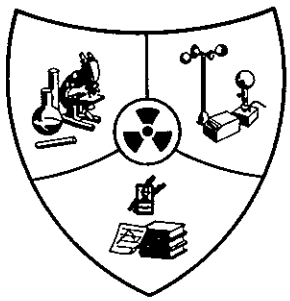
BASIC ANATOMICAL, DIETARY, AND PHYSIOLOGICAL DATA FOR RADIOLOGICAL CALCULATIONS

February 24, 1956



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BASIC ANATOMICAL, DIETARY, AND PHYSIOLOGICAL DATA FOR RADIOLOGICAL CALCULATIONS

By

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Biology Section

February 24, 1956

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*Major, (V.C.) U.S. Air Force

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BASIC ANATOMICAL, DIETARY, AND PHYSIOLOGICAL DATA FOR RADIOLOGICAL CALCULATIONS

L. K. Bustad and J. L. Terry*

Values for food consumption by man and animals are prerequisite to estimating the hazards of consuming vegetation contaminated with radioactive material. This report extends a previous paper on anatomical and physiological values for domestic animals(1) by listing dietary intakes for adults and children. Additional anatomical and physiological data on domestic animals are also included.

Listed in Table 1 are average and maximum values as estimated by the authors from published values (2-6) of weekly food consumption by adults and children. The source material appears in tabular form in the appendix to this document. The survey data of Clark and LeBovit(2) were given strong weighting. The average column given in Table 1 represents the quotient of the average family consumption and the average number of persons over two years of age in the family unit irrespective of age, except where noted.

The maximum values were obtained by determining the average intake value for the income group exhibiting the greatest consumption of each specific food item. No attempt is made to estimate extreme individual consumption values.

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* Major, (V.C.) U. S. Air Force

TABLE 1

Dietary Values for Man

Amounts in grams (unless otherwise noted) per person per week

Item	Average	Maximum
Milk and milk products	6.2 quarts	7.8 quarts
Flour and flour equivalent	1850	2070
Fats and oils	580	900
Eggs	0.82 doz.	1.04 doz.
Sweets, sugar	830	1110
Fresh fruits	1070	5800*
Fresh vegetables		
Potatoes	1990	2220
Leafy vegetables	155*	920*
Other vegetables	730*	2800*
Canned fruits and vegetables	1500	1750
Frozen fruits and vegetables	60	150
Dried fruits and vegetables	100	190
Meat and Fish		
Beef	440	620
Pork	750	800
Other	220	270
Poultry	250	300
Fish	200	300

* Children only

Critical anatomical data for domestic animals together with food, water, and air intake are found in Table 2.

The average daily milk production per cow in the United States is about 9 liters, which is probably slightly low for the Hanford environs where there is a high proportion of purebred herds. The daily intake value of dry feed listed is for the time of year when pasturage is negligible. Cattle on dry feed may be fed two thirds of the dry feed value listed supplemented by 10 to 15 kg of silage per day. Green feed is the amount of succulent pasturage ingested by a grazing animal.

The estimated bone mass for beef cattle and sheep is 10 per cent of the body weight while in pigs it is 7.5 per cent and in adult dairy cattle it is 12 per cent of the body weight. However, published data (19) show that in young bull calves the proportion of bone may be as high as 40 per cent of body weight.

TABLE 2

Anatomical and Physiological Data on Domestic Animals

Animal	Body Weight (kg)	Muscle Mass[20] (kg)	Thyroid Weight (g)	Bone Mass[20] (kg)	Blood Volume[20] (liters)
Dairy Cattle	500[8]	160	30[12, 13]	60	35
Beef Cattle	450[9]	180	25[12, 13, 14]	45	30
Sheep	70[10]	24	8[12, 14]	7	5.5
Pig	200[11]	85	15[12]	16	10

Animal	Daily Water Intake on Dry Feed (liters)	Tidal Air[7] Liters/ Minute	Daily Feed Intake (kg)	
			Dry	Green
Dairy Cattle	80[9]	90	9[9]	60[8, 16]
Beef Cattle	60[9, 15]	80	8[9, 10]	50[9, 15, 17, 18]
Sheep	4[9, 10]	6	2[9, 10]	7[17, 18]
Pig	15[9, 11]	6.5	4[9, 11]	6[17, 18]

APPENDIX

Dietary Values for Man

TABLE A

Food Consumption of Farm Families (2)
(Amounts in grams, unless otherwise noted; per capita consumption per week)

Item	Average	Maximum
Milk and milk products	6.2 quarts (5870 ml)	7.8 quarts (7380 ml)
Flour and flour equivalent	1850	2070
Fats and oils	580	900
Eggs	0.82 doz.	1.04 doz.
Sugar and sweets	830	1110
Fresh fruits	1070	1490
Fresh vegetables		
Potatoes	1990	2220
Others	620	640
Canned fruits, vegs., and juices	1500	1750
Frozen fruits and vegetables	60	150
Dried fruits and vegetables	100	185
Meat		
Beef	440	620
Pork	750	800
Other	220	270
Poultry	250	300
Fish	200	300

The number of families included in the study was 235 with an average of 2.71 persons per family. The consumption by all families of all income groups was found. This figure was divided by the number of families and by the average number of persons per family to arrive at an average per capita consumption. Classification of families as to income and number of families per income group is as follows:

Income (dollars)	No. of Families	Income (dollars)	No. of Families
Under 1000	62	3000 - 3999	29
1000 - 1999	64	Over 4000	21
2000 - 2999	43	Not Classified	16

TABLE B

Consumption of Fresh Fruits and Vegetables for Yakima and Everett School Children(3)

(Amounts in grams; per capita consumption per week)

Item	Average for 247 children	Individual maximum
Fruits*	800	5800
Leafy vegetables	155	922
Other vegetables (excluding underground vegetables)	730	2800

* Includes tree fruits, berries, rhubarb, grapes and raisins.

TABLE C

Recommended Amounts for Satisfactory Diet(4)

(Amounts in grams, unless otherwise noted; per capita consumption per week)

Item	Man	Child
Milk	3.5 quarts (3310 ml)	6 quarts (5680 ml)
Flour and flour equivalent	1800	1150
Potatoes	1500	1000
Fruits	570	570
Leafy, green, and yellow vegs.	1350	1350
Other vegetables	900	500
Fats and Oils	450	230
Sugars	450	230
Meat, poultry, and fish	900	500
Eggs (number)	3	5

TABLE D

Apparent Consumption of Food Items per Capita for 1954 (5)

Item	Consumption
Beef	34 kg
Veal	4.6 kg
Lamb and mutton	1.9 kg
Pork (excluding lard)	45 kg
Fish, fresh and frozen	2.68 kg
Eggs (number)	410
Chicken (eviscerated)	11 kg
Turkey (eviscerated)	2.0 kg
Cheese	3.4 kg
Condensed and evap. milk	8.8 quarts (8330 ml)
Fluid milk and cream	178 quarts (168 L)
Vegetables fresh (total)	66 kg
Grains - Wheat, flour	58 kg

The values above (Table D) and on the following page (Table E) are total production figures for the United States divided by the population. These values thus supply comparative check points for minimum per capita consumption and were not used to determine average or maximum values.

TABLE E

Apparent per Capita Consumption of Food Products for the Year 1953 (6)

Item	Consumption
Beef	34 kg
Veal	4.2 kg
Lamb and mutton	2 kg
Pork (excluding lard)	29 kg
Fish	4.9 kg
Eggs (number)	397
Chicken (eviscerated)	10 kg
Turkey (eviscerated)	1.9 kg
Cheese	3.5 kg
Condensed and evap. milk	8.8 quarts (8330 ml)
Fluid milk and cream	176 quarts (166 L)
Ice cream (product weight)	7.6 kg
Fats and oils, total, fat content	20 kg
Fruits	
Fresh	50 kg
Processed	20 kg
Vegetables	
Fresh	64 kg
Canned	19 kg
Frozen	2.5 kg
Potatoes	52 kg
Dry Edible Beans	3.8 kg
Sugar	43 kg
Grains	
Wheat, flour	59 kg
Wheat breakfast cereals	1.4 kg
Corn products	14 kg
Oat products	1.6 kg
Barley products	0.6 kg
Rye flour	0.7 kg
Rice milled	2.6 kg

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