

COURSE TITLE: Animal Production

SECTION: Principles of Animal Nutrition


COURSE CODE: VETM1111

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Lecture 4

Rodent diets - composition

Committee Report

AIN-93 Purified Diets for Laboratory Rodents: Final Report of the American Institute of Nutrition Ad Hoc Writing Committee on the Reformulation of the AIN-76A Rodent Diet

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ABSTRACT For sixteen years, the American Institute of Nutrition Rodent Diets, AIN-76 and AIN-76A, have been used extensively around the world. Because of numerous nutritional and technical problems encountered with the diet during this period, it was revised. Two new formulations were derived: AIN-93G for growth, pregnancy and lactation, and AIN-93M for adult maintenance. Some major differences in the new formulation of AIN-93G compared with AIN-76A are as follows: 7 g soybean oil/100 g diet was substituted for 5 g corn oil/100 g diet to increase the amount of linolenic acid; cornstarch was substituted for sucrose; the amount of phosphorus was reduced to help eliminate the problem of kidney calcification in female rats; L-cystine was substituted for DL-methionine as the amino acid supplement for casein, known to be deficient in the sulfur amino acids; manganese concentration was lowered to one-fifth the amount in the old diet; the amounts of vitamin E, vitamin K and vitamin B-12 were increased; and molybdenum, silicon, fluoride, nickel, boron, lithium and vanadium were added to the mineral mix. For the AIN-93M maintenance diet, the amount of fat was lowered to 40 g/kg diet from 70 g/kg diet, and the amount of casein to 140 g/kg from 200 g/kg in the AIN-93G diet. Because of a better balance of essential nutrients, the AIN-93 diets may prove to be a better choice than AIN-76A for long-term as well as short-term studies with laboratory rodents. *J. Nutr.* 123: 1939-1951, 1993.

INDEXING KEY WORDS:

- purified diet • nutrient requirements
- rats • mice

confident with the nutritional aspects of their studies. There was an increasing awareness of a need for nutritionally adequate purified diets that could be used to standardize studies among laboratories. The intent of standardization of test diets for laboratory animals was to reduce the variation inherent in cereal-based or natural ingredient-based diets and to facilitate interpretation of results among experiments and laboratories. The outcome of the committee's deliberations was the now well-known AIN-76 rodent diet. Detailed compositional analysis of this diet and the vitamin and mineral mixes can be found in AIN (1977).

In 1982, a workshop, Nutritional Standards for Laboratory Animal Diets, was sponsored by the International Committee for Laboratory Animal Science at the XII International Congress of Nutrition (Coates 1982a and 1982b). Participants at the workshop expressed concern that poor communication between non-nutritionists and nutritionists caused the former to be "insufficiently aware of the potential influence that a test animal's diet can have on its response to a test compound." Nutritionists, on the other hand, were thought to have inadequately considered the effects of long-term feeding of currently formulated diets. It was the consensus of the workshop participants that a general diet should be formulated that would "enable valid comparisons to be made between results of toxicity or oncogenicity trials in different laboratories."

Rodent diet – “normal”

AIN-93G Purified Rodent Diet

Ingredient	kcal./gm	grams/kg	kcal./kg
Casein, High Nitrogen	3.58	200	716
L-Cystine	4	3	12
Sucrose	4	100	400
Cornstarch	3.6	397.486	1430.9496
Dyetrose	3.8	132	501.6
Soybean Oil	9	70	630
t-Butylhydroquinone	0	0.014	0
Cellulose	0	50	0
Mineral Mix #210025	0.88	35	30.8
Vitamin Mix # 310025	3.87	10	38.7
Choline Bitartrate	0	2.5	0
		1000.0	3760.0496

Commercial feed analyses (an example)

INTRODUCTION

One (1) sample of animal feed was submitted by the client for determination of Ash, Moisture, Carbohydrates, Protein, Total Fat, Crude Fibre and Calorific content.

METHODOLOGY

The following methods were used to carry out the analysis:

Ash	:	AOAC ¹ Method No. 923.03
Moisture	:	AOAC ¹ Method Nos. 934.01 & 930.02
Carbohydrates	:	Calculation by difference from fat, protein, moisture & ash
Protein	:	Kjeldahl digestion and distillation using a Tecator Kjeltec system in accordance with CAR/CHEM.FM.4.1
Total Fat	:	AOAC ¹ Method No. 920.39
Crude Fibre	:	In-house Method
Calorific content	:	Determined by a bomb calorimeter

RESULTS


Analysis	Sample Value A 0379/08
Ash, % ^(w/w)	7.84
Moisture, % ^(w/w)	8.41
Total Carbohydrates, % ^(w/w)	59.05
Protein, % ^(w/w)	22.40
Total Fat, % ^(w/w)	2.30
Crude Fibre, % ^(w/w)	1.22
Calories (Kcal/g)	4.01

Dates Analysed: 2008-04-03 – 2008-04-17

REFERENCE:

1. Harwitz W (Ed), *Official Methods of Analysis of AOAC International*, 16th Ed. Maryland, AOAC International, 1995.


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Analytical
Communities

note
standard
methods

values of
interest

Rodent diet – Modified to contain high fat & high sucrose

Identify the changes that
were made??

Why can the “normal” diet
be used as a control for this
“experimental” diet??

DYET# 117839

Modified High Fat/High Sucrose AIN-93G Purified Rodent Diet

Ingredient	kcal./gm	grams/kg	kcal./kg
Casein	3.58	200	716
L-Cystine	4	3	12
Sucrose	4	452.01	1808
Cornstarch	3.6	47.48	170.9280
Dyetrose	3.8	0	0.0
Soybean Oil	9	70	630
Lard	9	130	1170
t-Butylhydroquinone	0	0.014	0
Cellulose	0	50	0
Mineral Mix #210025	0.88	35	30.8
Vitamin Mix # 310025	3.87	10	38.7
Choline Bitartrate	0	2.5	0
		1000.00	4576.4680

Journal of Nutrition v123, 1941(1993)

Shamjeet Singh, UWI, St. Augustine Campus-Trinidad, West Indies, 5/31/12

Rodent diet – vitamin mix

AIN-93-VX Vitamin Mix (use at 10 g/kg of diet)

Ingredient	grams/kg
Niacin	3
Calcium Pantothenate	1.6
Pyridoxine HCl	0.7
Thiamine HCl	0.6
Riboflavin	0.6
Folic Acid	0.2
Biotin	0.02
Vitamin E Acetate (500 IU/g)	15
Vitamin B12 (0.1%)	2.5
Vitamin A Palmitate (500000 IU/g)	0.8
Vitamin D3 (400000 IU/g)	0.25
Vitamin K1/Dextrose Mix (10 mg/g)	7.50
Sucrose	967.23
	1000.00

Rodent diet

– HF/FS with mg/kg Folic Acid

5

Modified High Fat/High Sucrose AIN-93G Purified Rodent Diet with 3 mg/kg of Folic Acid Added

Ingredient	kcal/gm	grams/kg	kcal/kg
Casein	3.58	200	716
L-Cystine	4	3	12
Sucrose	4	449.01	1796
Cornstarch	3.6	47.48	170.9280
Dyetrose	3.8	0	0.0
Soybean Oil	9	70	630
Lard	9	130	1170
t-Butylhydroquinone	0	0.014	0
Cellulose	0	50	0
Mineral Mix #210025	0.88	35	30.8
Vitamin Mix # 310025	3.87	10	38.7
Choline Bitartrate	0	2.5	0
Folic Acid Premix (1 mg/g folic acid)	4	3	12
		1000.00	4576.4680

Discussion.....

With respect to the following rations.....consider and comment on the following:

- the intended farm animal
- the intended physiological state
- the sources and molecular state of carbohydrates, proteins, fats, minerals and vitamins
- any feed additives or enhancements
- other comments

- ***Broiler Starter***
- ***Protein Milk Booster***
- ***Rabbit feed***
- ***Pig grower***
- ***Sheep and goat ration***



BROILER STARTER

T3210323

REG. POT TORRID

MEDICATED

For growth promotion, feed efficiency and improving pigmentation. An aid in the prevention of coccidiosis. Feed continuously as the sole ration to broiler chickens.

WARNING: Do not feed to laying hens, Do not allow Horses or other equines access to formulations containing Salinomycin. Ingestion of salinomycin by equines has been fatal. Do not allow rabbits, hamsters, guinea pigs, horses or ruminants access to feeds containing lincomycin. Ingestion by these species may result in severe gastro intestinal effects.

ACTIVE DRUG INGREDIENT

Salinomycin	60g/metric tonne
Lincomycin.....	2.2g/metric tonne

GUARANTEED ANALYSIS

Crude Protein, Min.....	21.0%
Crude Fat, Min.....	2.5%
Crude Fibre, Max.....	5.0%

INGREDIENTS

Grain Products, Plant Protein Products, Processed Grain By-Products, Animal Fat preserved with BHA, Calcium Panthothenate, Deflourinated Phosphate, Niacin Supplement, Menadione Sodium Bisulfite, Riboflavin Supplement, D-activated Animal Sterol (Source of Vitamin D3), Ethoxyquin (a preservative), Vitamin B12 Supplement, Vitamin A Supplement, Vitamin E Supplement, Choline Chloride, Ground Limestone, Salt and Traces of Manganous Oxide, Calcium Iodate, Iron Carbonate, Iron Sulfate, Copper Sulfate and Zinc Oxide. 945 TR



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PROTEK MILK BOOSTER

T6024000

18% PROTEIN EQUIVALENT

GUARANTEED ANALYSIS

Protein Equivalent Min.....	18.0%
Crude Protein Min.....	15.0%
Crude Fat, Min.....	2.5%
Crude Fibre, Max	8.5%

INGREDIENTS

Grain Products, Plant Protein Products, Processed Grain By Products, Cane Molasses, Calcium Propionate, Ethoxyquin, Vitamin A Supplement, D-activated Animal Sterol (Source of Vitamin D3), Vitamin E Supplement, Ground Limestone, Tri-calcium Phosphate, Salt and traces of Manganous Oxide, Calcium Iodate, Iron Sulfate, Copper Sulfate, Zinc Oxide, Cobalt Carbonate, Sodium Selenite and Protek Premix.

MANUFACTURED UNDER ONE OF THE FOLLOWING
U.S. PATENTS 4,664,905 - 4,704,287 OR 4,737,365

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RABBIT FEED

T9610000

Guaranteed Analysis

Crude Protein, minimum.....	17.0 %
Crude Fat, minimum.....	2.5 %
Crude Fiber, maximum.....	15.0 %

Ingredients

Grain Products, Plant Protein Products, Processed Grain By- Products, Cane Molasses, Methionine Supplement, Calcium Propionate, Ethoxyquin, Vitamin A Supplement, D-activated Animal Sterol (Source of Vitamin D3), Vitamin E Supplement, Menadione Sodium Bisulfite, Vitamin B 12 Supplement, Riboflavin Supplement, Niacin, Calcium Pantothenate, Folic Acid, Ground Limestone, Tricalcium Phosphate, Salt and Traces of Cobalt Carbonate, Manganous Oxide, Calcium Iodate, Iron Sulfate, Copper Sulfate, Zinc Oxide and Sodium Selenite.

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HI GAIN PIG GROWER (PELLETS) (CODE #5100)

GUARANTEED ANALYSIS

Moisture (Max%)	13.00
Protein (Min%)	15.50
Fat (Max%)	8.00
Fibre (Max%)	5.50
Ash	4.88



ACTIVE DRY INGREDIENT:

Chlorotetracycline 110g

INGREDIENTS

Grain Products, Plant Protein Products, Processed
Grain By Products, Limestone, Dicalcium Phosphate,
Salt, Trace Minerals and Vitamin Products

MANUFACTURED BY:

National Flour Mills Ltd

27-29 Wrightson Road

Port of Spain, Trinidad

Phone: 868-625-2416/2417 Fax: 868-623-0956

NET WEIGHT AS INDICATED ON PACKAGE

SHEEP & GOAT RATION T9250000

GUARANTEED ANALYSIS

Crude Protein, Min.....14.0%
Crude Fat, Min.....2.5%
Crude Fibre, Max.....12.0%

INGREDIENTS

Grain Products, Plant Protein
Products, Processed Grain
By-Products, Cane Molasses,
Vitamin A Supplement, D-activated,
Animal Sterol (Sources of Vitamin
D3), Vitamin E Supplement, Ground
Limestone, Tricalcium Phosphate,
Salt and traces of Manganous
Oxide, Calcium Iodate, Iron Sulfate,
Zinc Oxide, Copper Sulfate, Cobalt
Carbonate and Sodium Selenite

967TR



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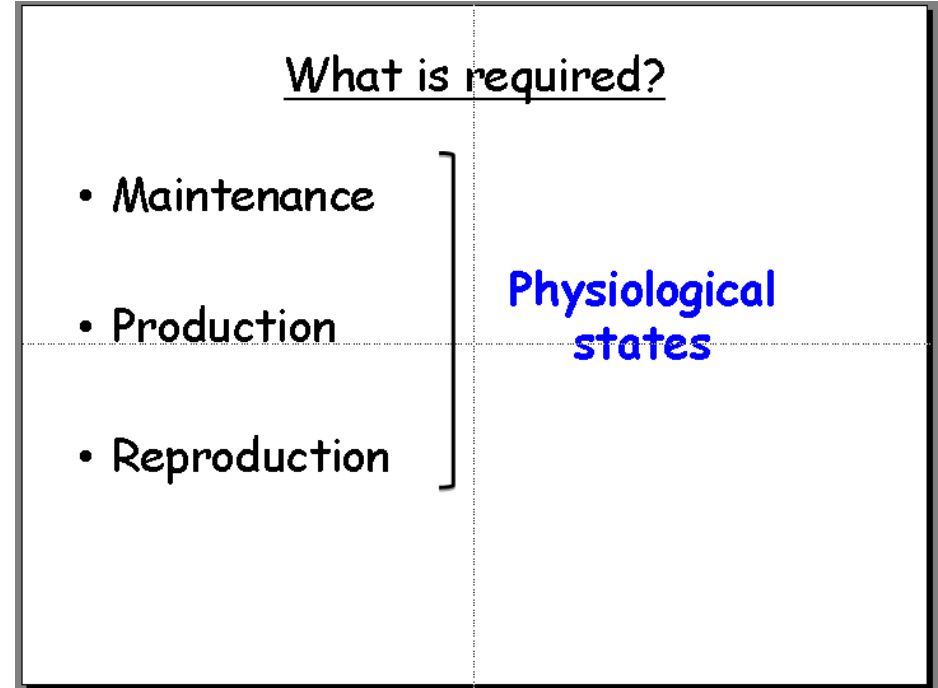
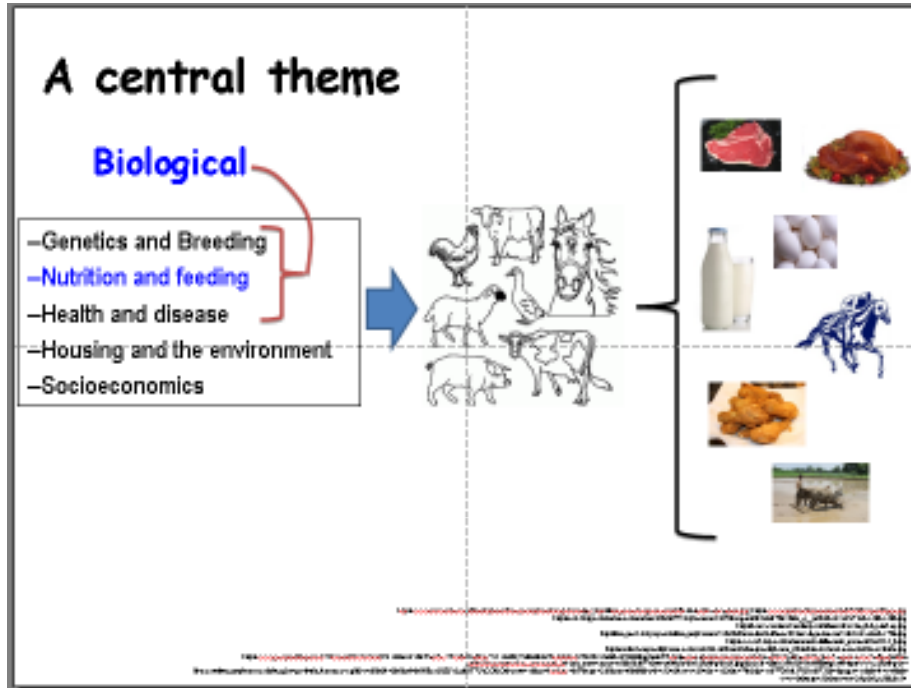
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“Guiding principles”



Be informed!

*The great aim of education is
not knowledge but action.*

– Herbert Spencer (1820–1903)