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NUTRITIONAL STATUS OF RURAL YOUTH

III. TILLAMOOK COUNTY

by

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This report on the nutritional status of rural youth in Tillamook County is the third in a series of five on a study being conducted by the Oregon Agricultural Experiment Station with the cooperation of the School of Home Economics of Oregon State College and the General Research Council of the Oregon State Board of Higher Education.

Procedure and Results

From December 1943 to February 1944, blood samples were obtained from 67 presumably healthy grade school children and 32 high school students in 14 Tillamook County schools. Approximately 10 per cent of the young people in any one school were chosen. Tests were made for hemoglobin values and plasma vitamin C levels. Only those subjects from whom two blood samples were secured on two non-consecutive days are included in the report. Each child also kept a record of all food consumed for the period of one week.

Hemoglobin

The average hemoglobin values obtained for 67 grade school and 30 high school subjects, as shown in Table 1, indicate that, in general, anemia is apparently not a problem among apparently healthy children in Tillamook County.

The average hemoglobin value for children under 13 years of age was 13.88 gms. per 100 ml. of blood, with only one child having a level below 12 gms., the average reported by Osgood and Baker in a study of 215 healthy Portland, Oregon, children. Boys 14 to 15 years showed an average of 14.91 grams of hemoglobin per 100 ml. of blood and those 16 to 18 years of age, 15.71 gms. With girls 14 to 15 years of age an average of 14.08 gms. was found and for those 16 to 18 years, 13.67 gms. of hemoglobin per 100 ml. of blood, with only one girl having a hemoglobin level of less than 12.97 gms. Osgood reported an average of 15.8 gms. of hemoglobin per 100 ml. of blood for males over 14, and 13.8 gms. for females over 14 years of age. All except three subjects were within the range of values of normal subjects reported by Osgood.

Table 1. Hemoglobin Values for Age and Sex. Tillamook County.

Age and Sex	No. Subjects	Grams of Hemoglobin per 100 ml. of blood	
		Average	Range
8-13 years			
Boys	30	13.89	12.83-15.56
Girls	30	13.87	11.28-15.38
14-15 years			
Boys	10	14.91	13.45-16.15
Girls	15	14.08	12.97-15.18
16-18 years			
Boys	4	15.71	15.01-16.56
Girls	8	13.67	9.34-14.83

Blood Plasma Vitamin C

Blood plasma vitamin C values were determined for 55 grade school and 32 high school students. Sixty-eight per cent of the grade school children and 71 per cent of the high school had plasma levels below 0.60 mg. of ascorbic acid (vitamin C) per 100 ml. of plasma, which has been judged as adequate by the Committee on Vitamins of the American Academy of Pediatrics (1940). For optimal nutrition the level should be at least 0.80 mg. per 100 ml. of plasma.

The average plasma ascorbic acid level for grade school children was 0.48 mg. per 100 ml. of plasma, while that for high school students was 0.41 mg.

Table 2. Comparison of Blood Plasma Ascorbic Acid (Vitamin C) Values of Grade and High School Children--Tillamook County

	No. Subjects	No. subjects with values below 0.60 mg.	Average Plasma Ascorbic Acid mg./100 ml.	Ranges
Grade school	55	37	0.48	0.12-1.04
High school	32	23	0.41	0.14-0.95

The difference between ascorbic acid plasma levels of the two sexes within age groups was not nearly so great as that between age groups. The highest average level was 0.62 mg. of ascorbic acid per 100 ml. of plasma for children under 11 years, the older children all showing lower average values.

Table 3. Plasma Ascorbic Acid (Vitamin C) Levels of Boys and Girls at Different Age Levels. Expressed as mg. of Ascorbic Acid per 100 ml. of Plasma

<u>Age Group</u>	<u>Boys</u>		<u>Girls</u>		<u>Total</u>	
	<u>No. Subj.</u>	<u>Ave.</u>	<u>No. Subj.</u>	<u>Ave.</u>	<u>No. Subj.</u>	<u>Ave.</u>
Less than 12 yrs.	7	0.57	5	0.68	12	0.62
12 to 13 yrs.	20	0.50	18	0.45	38	0.48
14 to 15 yrs.	9	0.21	17	0.44	26	0.36
16 to 17 yrs.	4	0.36	7	0.51	11	0.43

#### Food Consumption Records

A high plasma ascorbic acid level in individual students was correlated with a high consumption of citrus fruits and tomatoes. Because, in general, the consumption of other raw fruits and vegetables was quite low, their consumption did not exert much influence on the plasma ascorbic acid level.

Table 4. Relationship of Numbers of Servings of Fruits and Vegetables per Week and Plasma Vitamin C Values in Different Age Groups

<u>Age Group</u>	<u>Mg. of ascorbic acid per 100 ml. of plasma</u>	<u>Citrus fruit and tomatoes</u>	<u>Other raw fruits and vegetables</u>	<u>Total citrus fruit, tomatoes and other raw</u>	<u>Other fruits and vegetables</u>
Less than 12 yrs.	0.62	4.31	4.46	8.77	21.93
12 to 13 yrs.	0.48	4.01	4.68	8.64	18.24
14 to 15 yrs.	0.36	4.72	3.44	8.16	17.37
16 to 17 yrs.	0.43	3.46	6.12	9.58	17.83

The varieties of vegetables eaten were not great, green beans, corn, peas, carrots, cabbage, lettuce, and dried beans occurring most often on the list. Few green leafy vegetables were found. Spinach occurred only 11 times in 651 days, sprouting broccoli 10 times and Brussels sprouts once.

An average of 14.1 glasses of milk per week or just about a pint of milk a day was consumed by these Tillamook County children. The range of milk consumption was from 0 to 34 glasses per week. This includes milk on cereal, milk shakes, and milk drinks as well as milk, although it does not include milk used in cooking. The average cheese consumption was one serving a week.

On the whole, meat, fish and poultry consumption was fairly high—an average of 10.9 servings a week.

Table 5. Consumption of Milk, Egg, Meat, Fruits and Vegetables

<u>Food</u>	<u>Average number of servings per week</u>
Milk and cream	14.1
Cheese	1.0
Eggs	3.9
Meat, fish and poultry	10.9
Citrus fruits and tomatoes	4.3
Raw vegetables	1.7
Lettuce	0.6
cabbage	0.3
carrots	0.4
celery	0.2
mixed raw salads and other	0.2
Raw fruits other than citrus	2.3
apples	1.9
other	0.4
Potatoes	7.3
Cooked and canned vegetables	7.0
Dry peas and beans	1.1
Cooked, canned and dried fruits	5.8

Table 6. Total Number of Servings of Fruits and Vegetables

Records of 651 days by 94 children

<u>Food</u>	<u>No. Servings</u>	<u>Food</u>	<u>No. Servings</u>
Citrus fruits-total	287	Dry peas and beans-total	102
oranges	202	navy beans	73
grapefruit	74	lima beans	14
lemons	11	red beans	13
Tomatoes-total	133	soy beans	1
tomatoes	111	split pea soup	1
tomato soup	22	Raw fruits-total	217
Potatoes	677	apples	176
Raw vegetables-total	165	bananas	32
lettuce	55	grapes	5
carrots	39	strawberries	4
cabbage	30	Canned, cooked, or dried	
celery	24	fruits-total	535
others	17	peaches	89
Cooked vegetables-total	651	mixed fruits and salad	75
green beans	123	fruit desserts	73
corn	98	apples	62
peas	96	pears	57
carrots	71	prunes	42
vegetable soup	68	cherries	21
beets	25	pumpkin pie	15
vegetable salad	25	pineapple	15
carrots and peas	22	raspberries	13
squash	19	apricots	9
sauerkraut	18	pineapple juice	8
cabbage	15	berries	8
spinach	11	youngberries	6
broccoli	10	plums	5
onions	9	crabapple pickles	5
parsnips	8	cranberries	5
cauliflower	7	strawberries	5
asparagus	6	avocado	4
turnips	6	rhubarb	4
rutabagas	4	loganberries	4
wilted lettuce	1	fruit juice	3
pumpkin	1	apple juice	1
celery and carrots	1	grape punch	1
Brussels sprouts	1	pickled pear	1
		dates	1

### Summary

1. The average hemoglobin values obtained for young people in Tillamook County would indicate that, according to present standards, anemia is not a problem in this county among otherwise healthy children.

2. Sixty-eight per cent of the grade school children and 71 per cent of the high school students had blood plasma vitamin C values below 0.60 mg. of ascorbic acid per 100 ml. of plasma, the standard here considered to indicate "adequacy."

3. The differences in plasma ascorbic acid values between sexes within age groups were not nearly so great as the differences between age groups. The highest average value was 0.62 mg. of ascorbic acid per 100 ml. of plasma for those under 12 years of age.

4. A significant relationship was found to exist between plasma ascorbic acid values and consumption of citrus fruits and tomatoes by individuals.

5. The kinds of vegetables eaten were not great. Few green leafy vegetables appeared on the food records.

6. Milk consumption averaged 14.1 glasses per week or just about a pint a day. Cheese was consumed on the average of once a week,

7. Meat, fish and poultry consumption averaged 10.9 servings a week.