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# NUTRITIONAL STATUS OF RURAL YOUTH

## IV. Sherman County

by

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The study of the nutritional status of rural youth in the State of Oregon is 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. This report on the nutritional status of rural youth in Sherman county is the fourth in a series of five.

### Procedure and Results

The study was conducted in Sherman county during March and the first week of April 1944. Because there are only 5 consolidated schools in Sherman county, approximately 10% of the young people in each school were chosen for study. Two blood samples were taken on non-consecutive mornings from 36 grade school and 20 high school students. Hemoglobin levels and plasma vitamin C values were determined. Each subject kept a food record of all he had eaten for the period of one week.

### Hemoglobin

Hemoglobin values were obtained for 36 grade school children and 20 high school students. In general, anemia does not appear to be a problem among healthy young people in Sherman county. With the exception of one girl 18 years old whose hemoglobin value was 11.93 grams per 100 ml. of blood, none of the subjects studied had a value below 13.0 grams.

As seen in Table 1, the hemoglobin of boys and girls under 12 years of age averaged 14.06 grams and 14.17 grams of hemoglobin per 100 ml. of blood, respectively, which values are well above the average of 12 grams found by Osgood and Baker in a study of 215 healthy Portland children. Twelve to 13 year-old boys showed an increase in hemoglobin values, which averaged 15.34 grams per 100 ml. of blood; for 14 to 15 year-old boys, the average was 15.94 grams; and for 16 to 18 year-old boys, 16.80 grams. Girls 12 to 13 years showed average value of 14.22 grams per 100 ml. of blood; 14 to 15 years, 15.25 grams; and 16 to 18 years, 14.01 grams. These hemoglobin values showed slightly higher average values for adolescent young people in Sherman county than the average of 15.80 grams of

hemoglobin per 100 ml. of blood for males over 14 and 13.80 grams for females over 14 as found by Osgood in his Portland study. Hemoglobin values of all subjects fell within the range reported by him for healthy children and young people.

Table 1. Hemoglobin Values for Boys and Girls in Age Groups
Sherman County

| Age and Sex | No. Subjects | Grams of hemoglobin per 100 ml. of blood | |
|---|---|---|---|
| | | Average | Range |
| 9 to 11 yrs. | | | |
| Boys | 8 | 14.06 | 13.32 - 15.07 |
| Girls | 8 | 14.17 | 13.04 - 14.63 |
| 12 to 13 yrs. | | | |
| Boys | 8 | 15.34 | 14.01 - 16.42 |
| Girls | 8 | 14.22 | 13.25 - 15.49 |
| 14 to 15 yrs. | | | |
| Boys | 6 | 15.94 | 14.62 - 17.97 |
| Girls | 3 | 15.25 | 14.66 - 15.66 |
| 16 to 18 yrs. | | | |
| Boys | 7 | 16.80 | 15.46 - 17.49 |
| Girls | 8 | 14.01 | 11.93 - 15.35 |

Plasma Vitamin C

The plasma vitamin C level depends on the daily intake of vitamin C. The Committee on Vitamins of the American Academy of Pediatrics has considered a level of 0.60 mg. of ascorbic acid (vitamin C) per 100 ml. of plasma as adequate. However, a level of at least 0.80 mg. per 100 ml. of plasma or more is needed for optimal nutrition.

Plasma vitamin C values were determined for 32 grade school children and 16 high school students. Sixty-five percent of the grade school and 75 percent of the high school subjects had levels below 0.60 mg. per 100 ml. of plasma. The average plasma ascorbic acid values were 0.48 mg. and 0.44 mg. respectively.

Table 2. Comparison of Blood Plasma Ascorbic Acid (Vitamin C) Values of Grade and High School Students

| | No. Subject | No. Subjects with Values Below 0.60 mg. | Average mg. of Ascorbic Acid per 100 ml. of Plasma | Ranges |
|---|---|---|---|---|
| Grade School | 32 | 21 | 0.48 | 0.14 - 0.99 |
| High School | 16 | 12 | 0.44 | 0.18 - 0.80 |

The differences in the plasma ascorbic acid averages for the sexes within age groups were about as great as the differences in average values among age groups. Neither were significant statistically, although the difference between values of sexes in the 10 to 11 year-old group approached significance.

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

| | Boys | | Girls | | Total | |
|---|---|---|---|---|---|---|
| Age group | No. Subject | Ave. | No. Subject | Ave. | No. Subject | Ave. |
| 10-11 yr. | 9 | 0.68 | 7 | 0.41 | 16 | 0.56 |
| 12-13 yr. | 6 | 0.52 | 6 | 0.34 | 12 | 0.43 |
| 14-15 yr. | 5 | 0.44 | 3 | 0.35 | 8 | 0.40 |
| 16-17 yr. | 5 | 0.33 | 7 | 0.49 | 12 | 0.41 |

Food Consumption Records

Examination of the food records in conjunction with plasma ascorbic acid values revealed a high correlation between the consumption of citrus fruits and tomatoes by individuals and the plasma ascorbic acid level. Raw fruits and vegetables other than citrus fruits and tomatoes were consumed in such comparatively small amounts that they had very little apparent influence on the plasma ascorbic acid level. Raw fruits other than citrus fruits were eaten, on the average, a little less than once a week; while raw vegetables were eaten, on the average, about three times a week. (Tables 4 and 5)

Table 4. Relationship of numbers of servings of fruits and vegetables per week and plasma ascorbic acid values in different age groups

| Age group | Mg. of ascorbic acid per 100 ml. of plasma | Citrus fruits and tomatoes | Other raw fruits and vegetables | Total citrus fruits, tomatoes and other raw | Other fruits and vegetables |
|---|---|---|---|---|---|
| 10-11 yr. | 0.56 | 5.25 | 4.27 | 9.52 | 16.73 |
| 12-13 yr. | 0.43 | 4.83 | 2.10 | 6.93 | 18.13 |
| 14-15 yr. | 0.40 | 4.06 | 3.08 | 7.14 | 17.01 |
| 16-17 yr. | 0.41 | 4.97 | 4.90 | 9.87 | 19.11 |

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

| Food | | Average number of servings per week |
|---|---|---|
| Milk and cream | | 20.7 |
| Cheese | | 0.9 |
| Eggs | | 7.0 |
| Meat, fish and poultry | | 10.9 |
| Citrus fruits and tomatoes | | 5.1 |
| Raw vegetables | | 3.1 |
| Lettuce | 1.2 | |
| Cabbage | 0.3 | |
| Carrots | 0.3 | |
| Celery | 0.4 | |
| Mixed raw and other raw | 0.9 | |
| Raw fruits other than citrus fruits | | 0.9 |
| Apples | 0.7 | |
| Other | 0.2 | |
| Potatoes | | 6.6 |
| Cooked and canned vegetables | | 6.3 |
| Dry peas and beans | | 1.4 |
| Cooked, canned and dried fruits | | 5.7 |

The varieties of vegetables consumed were not great. Lettuce, corn, peas, green beans, carrots, cabbage, and dry beans appeared most often on the food records. (Table 6) Of the green leafy vegetables, spinach was eaten only 25 times in 461 days. Beet greens was the only other green leafy vegetable on the lists. The servings of cooked and canned vegetables, not including potatoes or dry beans and peas, averaged 6.3 servings per week.

The Sherman county young people in the study consumed an average of 20.7 glasses of milk per week or almost 3 glasses per day, including drinks such as cocoa, milk shakes, etc. and milk and cream on cereal but not milk used in cooking. The range in milk consumption was from $\frac{1}{2}$ a glass per week to 51 glasses per week.

Meat, fish and poultry consumption averaged 10.9 servings per week. Eggs were consumed on the average of one a day.

Table 6. Numbers of servings of fruits and vegetables
Records of 461 days by 63 children

| Food | No. of servings | | Food | No. of servings | |
|---|---|---|---|---|---|
| Citrus fruits - total | | 249 | Dry peas and beans - total | | 90 |
| oranges | 181 | | navy beans | 36 | |
| grapefruit | 63 | | chili beans | 34 | |
| lemonade | 5 | | lima beans | 12 | |
| Tomatoes - total | | 105 | pea soup | 8 | |
| tomatoes | 87 | | Raw fruits - total | | 53 |
| tomato soup | 18 | | apples | 40 | |
| Potatoes | | 434.5 | pears | 5 | |
| Raw vegetables - total | | 206 | bananas | 5 | |
| lettuce | 76 | | strawberries | 3 | |
| celery | 26 | | Cooked, canned and dried | | |
| carrots | 22 | | fruit - total | | 376 |
| cabbage | 21 | | peaches | 107 | |
| other raw and mixed veg. | 61 | | apricots | 36 | |
| Cooked vegetables - total | | 400 | cherries | 36 | |
| corn | 55 | | pears | 34 | |
| peas | 53 | | apples | 32 | |
| green beans | 51 | | mixed fruit & salads | 31 | |
| carrots | 46 | | prunes and plums | 30 | |
| vegetable soup | 42 | | berries | 16 | |
| spinach | 25 | | rhubarb | 12 | |
| beets | 17 | | raisins | 12 | |
| cabbage | 17 | | pineapple | 11 | |
| parsnips | 15 | | apple juice | 8 | |
| vegetable salad | 13 | | figs | 2 | |
| turnips | 9 | | gooseberries | 2 | |
| peas and carrots | 7 | | dried banana | 2 | |
| cauliflower | 6 | | dates | 1 | |
| sweet potato | 6 | | grape juice | 1 | |
| sauerkraut | 5 | | pumpkin pie | 1 | |
| succotash | 5 | | | | |
| mixed | 5 | | | | |
| asparagus | 4 | | | | |
| celery | 4 | | | | |
| onions | 3 | | | | |
| squash | 3 | | | | |
| mixed vegetable juices | 3 | | | | |
| rutabagas | 2 | | | | |
| carrots and onions | 2 | | | | |
| peas and asparagus | 1 | | | | |
| beet greens | 1 | | | | |

## Summary

1. According to present standards for hemoglobin values, anemia does not appear to be a problem among the healthy young people in Sherman county. All but one subject had a level of 13.0 gms. hemoglobin or more per 100 ml. blood.

2. Sixty-five percent of the grade school children and 75 percent of the high school students had plasma ascorbic acid (vitamin C) levels below 0.60 mg. per 100 ml. of plasma. The average plasma values for these two groups were 0.48 mg. and 0.41 mg. of ascorbic acid respectively.

3. The differences in average ascorbic acid values between sexes within age groups were about as great as those between age groups. None of the differences were significant statistically.

4. There was a significant correlation between the consumption of citrus fruits and tomatoes by individuals and plasma ascorbic acid level. Raw fruits and vegetables other than citrus fruits and tomatoes were consumed in such comparatively small amounts that they had very little influence on plasma ascorbic acid level.

5. The varieties of vegetables eaten were small. Servings of cooked and canned vegetables not including potatoes or dry legumes averaged 6.3 servings per week.

6. Milk consumption as milk or milk drinks averaged 20.7 glasses of milk per day or almost 3 glasses daily. The range was from ½ a glass up to 51 glasses per week.

7. Consumption of other protein foods was comparatively high, averaging 10.9 servings per week of meat, fish and poultry, and seven eggs per week.