of those who experiment in feeding animals and those who get their information from observing "native" peoples. Specifically, lean muscle has been reported as of little or no anti-scorbutic value with experimental animals, though it appears to be a sufficient anti-scorbutic when used by Eskimos or polar explorers.

The statement is frequently seen that carnivorous man would suffer from scurvy on a diet of meat, except that he is protected by eating such organs as the liver which are rich in Vitamin C. A variant of the statement is that you can remain in good health on a meat diet, provided you eat the whole animal or practically the whole of it.

One of the conclusions which most of those concerned drew from the experiment where two of us lived exclusively on meat for a year, under the supervision of the Russell Sage Institute of Pathology,[1] was that you do not need to eat the whole animal, or anything approximating that, in order to be protected from deficiency diseases.

The explanation has been advanced that if a guinea pig develops scurvy on lean meat and a man does not it is because men differ in some ways from guinea pigs. Another point seems worth raising.

The flesh food of most or all carnivorous people, such as uncivilized Eskimos or northern explorers who live by hunting, contains a great deal of blood. But (perhaps deriving our method from Semitic practice) our butchers are careful to bleed animals. A given weight of animal food as consumed by an Eskimo therefore contains a considerable proportion of an ingredient nearly absent from butcher's meat or from meat as obtained by farm butchering.

The all-meat diet which protected Karsten Andersen and me from scurvy for a year (1928–29) in New York had occasional meals of liver and bacon. But the diet which brought a rapid recovery from advanced scurvy to Lorne Knight and Harold Noice in 1917, as described on pages 615–619 of my book, "The Friendly Arctic" (New York, 1921), contained no liver. There were absent from it, too, most of those organs which are usually cited by dietitians in explaining how it is that carnivorous man does not have scurvy. The things eaten were chiefly lean muscle.

It would, then, seem worth considering whether the discrepancies between human and animal experimentation with regard to the anti-scorbutic value of flesh foods may not be due to the presence of considerable quantities of blood in one diet and to the comparative absence of it from the other.

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[1] Clarence W. Lieb, M.D., *Jour. of the American Medical Association*, July 6, 1929.

THE INCIDENCE OF COLOR-BLINDNESS AMONG JEWISH MALES

THE writer gave the Ishihara color-blindness test to 529 New York Jewish boys and men, 474 of whom were students in New York University. No subject was included unless his parents and all four grandparents were Jewish.

Each subject was tested individually, one eye at a time, under good light. If he misread or was unable to see the numbers on two or more of the ten plates normally read by people with complete color sense the subject was classed as color-blind or color-weak.

Forty subjects, or 7.56 per cent. of the total number tested, were color-blind or color-weak. Of this number, three were unable to see a single number beyond the first and may be considered totally color-blind. Eighteen others were so defective that they misread every plate beyond the first. The other 19 subjects made errors on from three to nine plates. None of the 40 made fewer than three errors. In common with other investigators we found green-blindness to be more prevalent than red-blindness. Eleven *Ss* were completely green-blind but not completely red-blind, while two were only red-blind.

For the most part the *Ss* were equally blind with their two eyes. However, we found three cases of differential blindness. One subject had normal vision with one eye, but incomplete color-vision with the other, as shown by the fact that he misread three plates with this eye. Two *Ss* could read no number beyond the initial one with one eye, but one of these students was only red-green blind in the other eye, while the second was only green-blind in the other eye.

About one half of the subjects' parents or grandparents were born in Russia, the rest being largely of Austrian, Polish, German and Hungarian stock. We considered the records of the Jews of Russian descent separately and found 8.1 per cent. of them to be color-blind.

In conclusion, our experimental results do not bear out Garth's[1] finding that Jewish males are different from other white males in color sensitivity.[2]

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SYMBOLS FOR THE ARTIFICIALLY RADIOACTIVE ELEMENTS

IN the issue of SCIENCE of August 21 (84: 183, 1936) Gerald M. Petty proposes to designate artificial

[1] T. R. Garth, SCIENCE, 71: 462, 1930; 77: 333–334, 1933.

[2] For further reference, see F. Clements, SCIENCE, 72: 203–204, 1930; K. B. M. Crooks, SCIENCE, 80: 269, 1934; L. G. Kilborn and Y. T. Beh, SCIENCE, 79: 34, 1934; W. Miles, *Jour. Gen. Psychol.*, 2: 535–543, 1929.

radioactive elements by prefixing "ra-" before the ordinary symbol. Mr. Petty seems to base this on the supposition that Ra is the correct prefix for the symbol of the natural radioactive elements such as Radiothorium, etc.

In order to avoid confusion, I should like to point out that the best usage has never employed Ra in this way as a prefix for "radio" but Rd, as for example, Rd Th, Rd Ac, etc. All the advantages of Mr. Petty's proposal may be retained and uniformity conserved if we continue to use Rd for the natural radioactive elements and use "rd-" for the artificial ones.

In case there is more than one active isotope of an element, we shall still have to give the mass number as a superfix. In case of isobaric isotopes (for the existence of which additional evidence is accumulating), we shall also have to indicate their life periods in parenthesis or adopt some other convention.

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SPECIAL ARTICLES

THE TRANSMISSIBLE AGENT IN THE ROUS CHICKEN SARCOMA NO. 1[1]

DURING the past decade an impressive amount of evidence has been accumulated associating the lipids, and more particularly the sterols, with growth of tissue, both abnormal and physiological.[2] The chemical relationship between the estrogenic hormones, many carcinogenic substances and cholesterol has been reported and reviewed by a large number of workers. While this investigation was in progress, Claude reported the partial purification of the Rous sarcoma filtrate. A large proportion of the protein and carbohydrate was removed by indirect means, leaving an active fraction which was largely lipid in nature. The lipid fraction was separated more completely by use of acetone, alcohol and ether, but no mention is made of its activity.[3]

The methods applied in this laboratory were aimed directly at isolation of the lipids, the usual chemical procedures being altered according to the known frailties of the agent, which are primarily those of thermolability and spontaneous oxidation. The first procedures yielded a product less active than one obtained by subsequent modifications but is worthy of note because of the additional information regarding solvents which can be utilized in the study of the active substance.

Between 200 and 400 grams of fresh tumor tissue, obtained by routine transmission of the Rous chicken sarcoma in Rhode Island Red chickens, was ground in a meat grinder and shaken from three quarters to one hour in an equal quantity of acetone. The acetone extract was separated by centrifugation and filtered. It was then concentrated *in vacuo,* under nitrogen, at 37° C. until only the watery residue remained, and injected immediately into chickens as the first acetone fraction. The partially dehydrated tumor was ground in a mortar with a second portion of acetone and similarly shaken, centrifuged and filtered clear. This, after evaporation of the solvent, was injected as the second acetone fraction. At times the first and second acetone fractions were combined and part injected as the combined acetone fraction. The remainder was re-extracted with benzene or, at a later date, carbon tetrachloride by shaking with several changes of the specific solvent. Meanwhile the acetone-treated tumor was extracted for three to four hours in a Soxhlet in partial vacuum at approximately 37° C. with either benzene or carbon tetrachloride. This was combined with the benzene or carbon tetrachloride extract of the acetone fraction, filtered clear and the solvent removed in vacuo as above. The residue was dissolved in benzoinated lard at 37° C. or suspended in saline and injected into the breast of chickens. Further details of this and subsequent procedures, as well as analytical studies carried out on these fractions will be described later *in extenso.*

Tumors identical with the Rous chicken sarcoma in morphology, metastatic habits and ease of transmission were obtained by injection of the first and the combined acetone fractions. The animals were given repeated inoculations at weekly intervals after the custom of those working with the synthetic carcinogenic substances. The earliest tumors to appear followed three injections. The majority developed tumors only after an interval of three to four months. The second acetone fraction and the benzene or carbon tetrachloride extract were unsuccessful when injected alone. The residue of the tumor after having been dried and in good part freed of the lipids did not produce tumors.

Feeling that the specific cancerogenic substance might still be present in the more purified benzene

[1] From the Department of Pathology, College of Physicians and Surgeons, Columbia University, New York City. This investigation has been aided by a grant from the Josiah Macy, Jr., Foundation.

[2] L. Loeb, *Jour. Am. Med. Asn.,* 104: 1597, 1935; A. Lacassagne, *Am. Jour. Cancer,* 27: 217, 1936; D. A. MacFayden and E. Sturm, SCIENCE, 84: 49, 1936; F. Breinl and E. Chrobok, *Ztschr. f. Immunitäts.,* 86: 274, 1935.

[3] A. Claude, *Jour. Exp. Med.,* 61: 27 and 41, 1935.