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Gastric Ascorbic Acid in the Gastritic Guinea Pig[1]

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Among other things, the rat differs from the human in having a squamous forestomach and an endogenous supply of ascorbic acid. When it was found (*1*) that a chemically induced gastritis in the rat resulted in a decrease of ascorbic acid in the stomach and adrenals, it became of considerable interest to determine if a similar relation exists in an animal having an entirely glandular stomach and lacking endogenous ascorbic acid. The present study, therefore, was carried out on the guinea pig.

TABLE 1

EFFECT OF EUGENOL ADMINISTRATION ON GASTRIC AND ADRENAL ASCORBIC ACID IN THE GUINEA PIG

No. of guinea pigs*	Treatment	Chem. form	Mean ascorbic acid	
			Stomach (mg %)	Adrenal (mg %)
11	H_2O controls (st)†	Oxidized	1.5 ± 0.69	5.3 ± 3.0
		Reduced	14.4 ± 0.42	117.7 ± 7.2
		Total	15.9 ± 0.52‡	123.0 ± 7.5
10	Eugenol (st)‡	Oxidized	1.0 ± 0.25	3.4 ± 2.9
		Reduced	7.9 ± 1.8	84.4 ± 4.4
		Total	8.9 ± 1.9	87.8 ± 2.6

* Weight loss not observed in any animal.
† By stomach tube.
‡ Differences between corresponding totals from the two groups are statistically significant. $P < 0.01$.

Male Rockland Farms guinea pigs weighing 350–450 g received Purina Rabbit Chow Checkers[3] and tap water ad libitum as well as daily intramuscular injections of 25 mg sodium ascorbate in 1.0 ml physiological saline. The guinea pigs were divided into 2 groups. The first group, controls, received 3-ml oral doses of water daily for 7 days. The second group received the same amount of a 1.0% emulsion of eugenol. The ascorbic acid was determined by the method of Roe *et al.* (*2*).

Introduction of the eugenol emulsion to the gastric lumen by stomach tube brought about a grossly evident gastritis which was absent in the water-fed controls. The total ascorbic acid concentration in the stomachs of the gastritic guinea pigs was significantly decreased by approximately 44%. In the same animals there was a simultaneous decrease of about 29% in the adrenals, which was probably associated with a systemic stress response. The ratio of oxidized to reduced ascorbic acid in the stomachs and adrenals of the gastritic animals was not significantly different from that in the controls (Table 1). The decrease in gastric tissue ascorbic acid during an induced gastritis is more pronounced in the guinea pig (44%) than in the rat (13%) (*1*). In the rat a smaller decrease of gastric ascorbic acid resulted, apparently because part of the loss was simultaneously replenished from biosynthetic sources.

The data suggest that the ascorbic acid decrease in the stomach of both species during gastritis is a result of rapid utilization of vitamin C at a site of regeneration. The rapid utilization of ascorbic acid at sites of regeneration also has been suggested by the work of Leise *et al.* (*3*), who reported that the percentage of takes in transplantation of a C 954 hepatoma is increased from 36 to 52% in C57L(Fx) mice when supplementary ascorbic acid is supplied. Moreover, Minor and Ramirez (*4*) have reported that cancer patients utilize more ascorbic acid than patients having nonmalignant disease, as determined by daily measurement of ascorbic acid intake and excretion. The present work suggests a similar rapid utilization of ascorbic acid in the gastritic mucosa.

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Chromosomal Interchanges as a Basis for the Delimitation of Species in *Oenothera*[1]

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The delimitation of two species upon the basis of their failure to form a hybrid is untenable wherever

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[3] Preliminary analysis of our stock of Purina Rabbit Chow Checkers indicated that the concentration of ascorbic acid was < 0.08 mg %.

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single or few gene differences or simple structural heterozygosity leads to the formation of nonviable combinations. Incipient species may owe their origins to differences such as these, but the accumulation of further differences must follow before what was once a single species may be considered as two. It is probably undesirable that there be any agreement concerning the exact degree of introgression which might be allowed between two taxa which yet remain as separate species. When, however, the differences between the two taxa become appreciably greater than the variation within each of these taxa, the two are certainly approaching the level of species. Conversely, the occurrence of as great or greater variation within two taxa than between them must place the two taxa in subspecific rank under a single species. The latter point of view will be used to show that two long-recognized species of *Oenothera* are probably only variations of a single species.

In a general survey of the cytogenetics of *Oenothera* subgenus *Raimannia,* Hecht (*1*) pointed out that *Oenothera affinis* Camb. and *Oenothera mollissima* L. might represent extremes in variation of a single species. This possibility has been considerably strengthened following a more detailed study involving six races of each of these two species (*2*). Morphologically *O. affinis* is distinguished from *O. mollissima* by its longer hypanthia and longer petals; cytologically, it was found that all the races of *O. mollissima* are complex heterozygotes with a circle of 14 chromosomes, whereas *O. affinis* includes complete homozygotes, intermediate types, and complex heterozygotes like those of *mollissima.*

Specific relationships in *Oenothera* are complicated by the fact that circle-of-14 types are a special type of species, consisting of two distantly related genomes maintained in a condition of permanent heterozygosity by virtue of a system of balanced lethals which prevents the formation or survival of the homozygous combinations. However, when two circle-of-14 races are crossed, the progeny may show pairing of at least some of their chromosomes. The number of pairs thus obtained is a measure of the relatively recent common origin of the chromosomes of the two genomes combined in the new hybrid, and therefore is a measure of the relationship of the parental genomes.

Six geographical races each of *O. affinis* and *O. mollissima* were crossed with each other in all possible combinations. Mature progeny were obtained from 28 (30 possible) of each of the intraspecific crosses and from 63 (72 possible) of the interspecific crosses. Many of these hybrids included two to four classes of progeny which differed in chromosome configuration, and may therefore be considered as different combinations of genomes. Combinations that indicated a difference of no more than 3 interchanges were considered to indicate a relatively close relationship, whereas 4 to 6 interchanges were considered as indicative of a more remote common origin of the genomes involved. Of the 50 interracial *affinis* combinations 39 (78%) differed by 3 or less than 3 interchanges. Only 4 of the 43 interracial *mollissima* combinations (10%) differed by 3 or fewer interchanges. Thirty-one per cent (34 out of a total of 108) of the interspecific combinations were similarly found to have closely related genomes. It appears, thus, that the genomes of *affinis* are more closely related to those of *mollissima* than are the *mollissima* complexes to each other. *O. affinis* and *O. mollissima* have essentially contiguous distributions in southern South America (*3*), and the evidence above strongly suggests that introgression occurs. Under these circumstances it is probable that *O. affinis* Camb. (and its several synonyms) should be included under the prior epithet *O. mollissima* L.

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Protein Metabolism and Interactions[1]

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This note applies and extends the methods of Sprinson and Rittenberg for the interpretation of protein metabolism and interactions (*1*). There is now available a sufficient quantity of experimental results (from widely scattered sources) to form the basis of an outline of body protein reactions.

The main or overall protein reactions may be interpreted on the basis of the simplified scheme of Fig. 1. The k's represent rate constants, and all the reaction rates are assumed to be first order with respect to the reactant.

Let A be the total amount of body protein and let f_j ($j=1$, 2, 3, or 4) be the fraction of that which is in protein x_j. Then if x_{js} is the amount of protein x_j when a balanced steady state is maintained, it follows that $x_{js}=f_jA$. In this formulation k_{j5} is the turnover rate of protein x_j, and the fraction $k_{05}/(k_{01}+k_{02}+\cdots+k_{05})$ may be called the fraction of exogenous protein. This fraction, $k_{05}/(k_{01}+\cdots+k_{05})$, is given by the A of Sprinson and Rittenberg's Eq. (1) (*1*). They found that this fraction is about 0.5 in normal adults on diets of their own choice. They also found that the corresponding substance, y, has a half-time of only about one-half day in the body. The results of Maas *et al.* (*2*) on the injection of rats with radioactive

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