Comments and Communications

Influence of Human Saliva and Blood Serum on Germination and Root Growth

Dvora Yardeni has published an interesting communication (*Science,* July 16, pp. 62–63) concerning the effect of human saliva as a germination inhibitor. That writer claims that human saliva inhibits germination of wheat seeds and particularly the growth of the embryonic radicles. She further states that the degree of inhibition caused by the saliva of the same individuals varied at different times, and that the inhibition of the radicle growth does not depend on sex or age. The present writer calls attention to the fact that pharmacological experiments on the germination of seeds and root growth of seedlings, studied on *Lupinus albus,* were made by him as early as 1922 and announced in 1923 (D. I. Macht and D. S. Lubin. *J. Pharm. exp. Therap.,* 1924, 22, 413). These experiments were performed in connection with studies on menstrual toxin. It was found that not only the saliva, but also the blood serum and various secretions of women in catamenia, are very toxic, both for germination and root growth of *Lupinus albus,* as compared with the saliva, blood serum, and various secretions of the same individuals between menstrual periods. The average root-growth inhibition of *Lupinus* seedlings in 1% solutions of saliva dissolved in plant physiological saline was 15%, whereas the average inhibition of seedlings grown in 1% of menstrual saliva solutions was 47%.

Much more accurate and scientifically reliable results were obtained with blood *sera* because these could be obtained under sterile conditions and without contamination of various elements present in the mouths of human beings. In fact, the above observations were the beginning of extensive researches on the subject of phytopharmacology, by the author and his co-workers, which have led to a number of important medical discoveries, particularly in connection with the diseases of pemphigus, pernicious anemia, leprosy, and trachoma (*J.A.M.A.,* 1927, 89, 753; *J. Invest. Dermat.,* 1947, 8, 171; *J. Philippine Islands med. Ass.,* 1928, 8, 523; *Folia Ophthalmol. Orient.,* 1935, 1, 358; *Protoplasma,* 1937, 27, 1).

More recently, the writer has been engaged in studying the effect of blood sera on the respiration of the germinating seeds of *Triticum* (wheat) and *Avena* (oat) and has found that the toxins of menstruation, pemphigus, and other diseases definitely inhibit oxidation and reduction processes of such germinating seeds.

Kramer and Silberschmidt (*Science,* October 15, p. 410), commenting on the Yardeni article, suggest that perhaps growth hormones in the saliva may explain its inhibiting action on seed germination and root growth.

In this connection we call attention to the fact that the idea entertained formerly in regard to inhibition of root growth by the growth hormones is no longer tenable. It was shown by Macht and Grumbein that the effects of indole acetic, indole butyric, and naphthalene acetic acids on roots of *Lupinus albus* seedlings depend on the concentration of the chemicals employed. Solutions up to one in one billion *do* inhibit growth. When, however, much less concentrated solutions of the hormones are used, there is actually a stimulation in root growth (*Amer. J. Bot.,* 1937, 24, 457).

On the basis of the writer's experiences, the inhibiting properties of saliva and blood sera may be more appropriately ascribed to some unknown toxin or toxic substance in those fluids rather than to a growth hormone.

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A New Organic Uranium Compound

A new organic uranium compound has been prepared from anhydrous uranium acetate and hexamethylene tetramine.

One hundred cc of an alcoholic solution of anhydrous uranium acetate was added at 24° C to 80 cc of an alcoholic solution of hexamethylene tetramine. The uranium solution contained 2.46% of acetate/100 gm of alcohol; the tetramine solution, 9.5 gm/100 gm of alcohol. The amine was therefore greatly in excess.

When the two solutions were mixed, a yellow ppt formed immediately. This was washed with hot alcohol, dried, and examined.

The substance showed needle-like crystals, decomposed at 185° C, and dissolved in glacial acetic acid, but was insoluble in alcohol. On analysis it gave U, 46.3; N, 9.7. [$(UO_2)(Ac)_2(CH_2)_6N_4$ gives U, 45.02 and N, 10.5.]

Evidently the two components are present in the molecular ratio of 1: 1.

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Dieyema paradoxum von Kölliker, 1849

The Mesozoa comprise one of the most controversial groups in the animal kingdom. The disagreement concerns their structure, life history, method of reproduction, and zoological status. The confusion arising from different interpretations of morphology and development is augmented by errors in nomenclature. Certain of these errors were rectified by Stunkard (*Amer. Mus. Nov.,* 1937, No. 908). Recently, study of the parasites of octopuses has necessitated a review of the literature on members of the family Dicyemidae.

The generic name *Dicyema* was selected by von Kölliker (*Ber. zoot. Anst. Würzburg,* 1849, 2, 59–66), since he first noted that these animals produce two distinct types of embryos, which he designated as "wurmförmig" and "infusorienartig." The two kinds of embryos had been observed and described by Erdl (*Arch. Naturg.,* 1843, 9, 162–167), who regarded them as developmental stages of a single individual. Kölliker studied the parasites found

in *Octopus vulgaris* and *Octopus macropus* and identified all the dicyemids found by him and those described by previous authors from other cephalopods as members of a single species, for which he proposed the name *Dicyema paradoxum*. The genus, as erected, was monotypic and *D. paradoxum* is the type species. The observations and descriptions of von Kölliker appear remarkably accurate and complete when compared with zoological reports of a century ago.

Subsequent investigations, however, have shown that *D. paradoxum* of Kölliker was a complex of several species. Van Beneden (*Bull. Acad. Roy. Belg.*, 1876, **41**, 1160–1205; 42, 35–97) restricted the genus *Dicyema* to parasites of octopuses; those from *O. vulgaris* were designated as *D. typus* and those from *O. macropus* as *D. clausianum*. The name *D. paradoxum* was omitted. Holding a view diametrically opposed to that of von Kölliker, van Beneden believed in absolute taxonomic correlation between hosts and parasites. New genera were erected for the dicyemid parasites of each genus of cephalopods other than *Octopus*, and the parasites of the several cephalopod species were regarded as distinct. In van Beneden's system the family Dicyemide consisted of 4 genera and 7 species. Species described by Wagener (*Arch. Anat. Physiol. wiss. Med.*, 1857, 344–364) were redescribed and renamed when assigned to the new genera. Whitman (*Mitt. zool. Stat. Neapel*, 1882, **4**, 1–89) described additional new species and showed that van Beneden's idea of strict host-parasite specificity was erroneous; that the same species could infect more than one host species and that a single host could harbor more than one species of parasite. Whitman was meticulous in restoring names proposed by Wagener for species that had been renamed by van Beneden. He stated (p. 4): "... in systematic zoology the claims of priority are not to be superseded by those founded on accuracy of description." But van Beneden had also renamed the parasites described by von Kölliker as *D. paradoxum*, recognizing two species which he designated as *D. typus* and *D. clausianum*, respectively. Whitman accepted these names, and they have been adopted by subsequent authors. Nouvel (*Arch. Biol.*, 1947, **58**, 59–220) stated: "Pour Kölliker, le genre *Dicyema* comprenait tous les Dicyémides connus (*D. paradoxum*). Quand Whitman a créé un second genre (*Dicyemennea*), l'auteur a conservé, pour l'un des genres, le nom de *Dicyema* car le description de Kölliker est précisément fondée sur deux espèces qui restaient dans le genre ainsi restreint." It is clear, therefore, that the name *D. paradoxum* must apply to one of the two species now known as *D. typus* and *D. clausianum*. In an earlier paper, Nouvel (*Bull. Soc. Hist. Nat. Toulouse*, 1946, **81**, 169–174) redescribed *D. typus* as the smaller of the two species, with a smaller number of somatic cells (16–20), usually 18 or 19, and stated that in this species the diapolar cells never form pendant verruciform enlargements. According to Nouvel, *D. typus* occurs only in *Octopus vulgaris*, whereas *D. clausianum* occurs in both *O. vulgaris* and *O. macropus*. Moreover, Nouvel stated that earlier authors including van Beneden (1876), Whitman (1882), Hartmann (1906), Lameere (1914, 1916, 1918, 1919), and he himself in former papers, had identified individuals of *D. clausianum* as *D. typus*.

The International Code of Zoological Nomenclature provides that, if a species is divided into two or more restricted species, its valid name must be retained for one of the restricted species. Van Beneden (1876) did not admittedly divide the species *D. paradoxum*; instead, he redescribed the organisms as members of two distinct and restricted species for which he proposed new names, although both species were retained in the genus *Dicyema*. Indeed, they were the only species included in the genus. The procedure is clearly invalid, since the genus *Dicyema* is based on its type species *D. paradoxum*. Whitman and subsequent authors have perpetuated the error in accepting the two specific names proposed by van Beneden. Despite any disavowal, van Beneden virtually divided the species, and the name *D. paradoxum* must be retained for one of the restricted species which stands as type of the genus. As noted, either *D. typus* or *D. clausianum* must be relegated to synonymy. Since von Kölliker described and figured large individuals with prominent verruciform enlargements of the diapolar cells, it seems probable that his description applies more properly to the species called *D. clausianum* by van Beneden. Accordingly, *D. clausianum* van Beneden, 1876 is suppressed as a synonym of *D. paradoxum* von Kölliker, 1849.

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Enpony and Enchresy

There are 5 functions of great importance in thermodynamics: the energy, entropy, enthalpy, and the free energy functions of Helmholtz and Gilbert Lewis. The first two functions have no other names. The third was formerly called heat content, but the name enthalpy, from το θαλπος (heat), seems to win. Helmholtz free energy is a rather awkward name for a very useful function, and the matter was worse when Gilbert Lewis unfortunately used the term free energy for another still more useful function. The latter has also been called thermodynamic potential and Gibbs' function.

I think everyone who has been teaching thermodynamics or has written textbooks in physical chemistry has felt the need for not bigger, but better, names for the two last-mentioned functions. May I suggest that Helmholtz free energy, which measures the work obtainable from a system at a constant temperature, be called *enpony*, from ὁ πόνος (work). The system does part of this work against the pressure of the surroundings and, in many processes, only the remainder (German *Nutzarbeit*) is utilized. This "useful work" is measured by Lewis free energy, which might be called *enchresy*, from ἡ χρῆσις (use, utility). These new terms do not seem less euphonious than the three older ones, and they are not liable to cause any confusion.

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