forming organ, and that the protein moiety of this ribonucleoprotein contains antibodies which are released in an active form upon the destruction of the ribonucleic acid moiety. These observations are consistent with the concept that the antibody molecule forms part of the ribonucleoprotein complex within the antibody-producing cell, and that this complex may, therefore, be the site of its synthesis. Similar observations have been made in the case of the release of the enzymes ribonuclease and deoxyribonuclease from a bacterial ribonucleoprotein[2], and it is possible that this is a general phenomenon of protein biosynthesis.

This investigation was supported in part by a research grant (*RG*-5876) from the National Institutes of Health, U.S.A. Public Health Service.

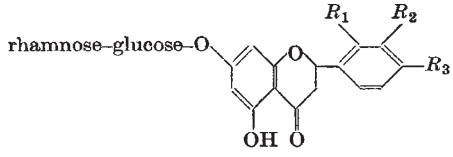
M. Feldman
D. Elson
A. Globerson

Department of Experimental Biology and
Section of Biochemistry,
Weizmann Institute of Science,
Rehovoth, Israel.

[1] Littlefield, J. W., Keller, E. B., Gross, J., and Zamecnik, P. C., *J. Biol. Chem.*, **217**, 111 (1955).
[2] Elson, D., *Biochim. Biophys. Acta*, **27**, 216 (1958); *Biochim. Biophys. Acta* (in the press).
[3] Siekevitz, P., and Palade, G. E., *J. Biophys. Biochem. Cytol.*, **4**, 309 (1958).
[4] Sterzl, J., and Hrubesova, M., *Folia Biologica*, **2**, 21 (1956).
[5] Hrubesova, M., Askonas, B. A., and Humphrey, J. H., *Nature*, **183**, 97 (1959).
[6] Palade, G. E., and Siekevitz, P., *J. Biophys. Biochem. Cytol.*, **2**, 171 (1956).
[7] Stavitsky, A. B., *J. Immunol.*, **72**, 360 (1954).

Flavonoids of the Ponderosa Lemon

The isolation and structure of citronin, a new flavanone glycoside from the peel of immature Ponderosa lemons (*Citrus limon* Burm. *f. ponderosa* Hort.) was reported some time ago by Yamamoto and Oshima[1]. From chemical and spectroscopic evidence it was concluded that citronin is 2′-methoxy-5,7-dihydroxyflavanone 7-rhamnoglucoside (*I*) and thus belongs to the rather uncommon group of flavonoids having a substituent at position 2′. In attempting to obtain this compound from samples of both mature and immature Ponderosa lemons, under conditions approximating those of Yamamoto and Oshima, it has been our experience that the only glycoside which can be isolated easily in crystalline form is neohesperidin (*II*). This was identified by elementary analyses, mixed melting point determination, infra-red spectrum, preparation of the phenylhydrazone derivative and isolation of the aglycone hesperetin from the hydrolysate. Neohesperidin differs from hesperidin only in the position of attachment of rhamnose to glucose[2]:



I, $R_1 = OCH_3$; $R_2 = R_3 = H$

II, $R_1 = H$; $R_2 = OH$; $R_3 = OCH_3$

The isolation of neohesperidin from the Ponderosa lemon is of interest for several reasons. First, as Swingle has pointed out[3], "the nature of the characteristic glucoside present in the tissues of a species of *Citrus* may be of definite taxonomic significance in distinguishing that species from another species to which it may have superficial resemblances". The Ponderosa is generally considered to be in the nature of a hybrid which most nearly resembles the lemon (*Citrus limon*), but it is also regarded as having certain characteristics of the citron and grapefruit[4]. Ordinary lemons have not been shown to contain neohesperidin, but do contain hesperidin, diosmin[5] and eriodictyol glycoside[6] as their principal flavonoids. From qualitative tests, we consider that the Ponderosa lemons used in the present work contained little if any hesperidin or eriodictyol glycoside. Therefore, to judge from the identity of the most abundant and easily detectable flavonoids, the Ponderosa lemon would seem to have little relation to ordinary lemons. It is noteworthy that neohesperidin has been found previously only in the sour orange (*Citrus aurantium*)[7] and trifoliate orange (*Poncirus trifoliata*)[8].

Secondly, although it would be unwarranted to suggest that citronin is identical with neohesperidin (since there appear to be several irreconcilable points of difference), it should be noted that some of the chemical evidence reported by Yamamoto and Oshima is incompatible with their structure *I*. According to these authors, citronin (*a*) gives no ferric colour; (*b*) gives *o*-hydrocoumaric acid methyl ether when cleaved with alkali; and (*c*) after hydrolysis to its aglycone gives 5,7,2′-trimethoxyflavanone on treatment with diazomethane. On the contrary, compound *I* or its aglycone would unquestionably give a ferric colour; would be expected to yield *o*-coumaric acid methyl ether (rather than the hydrogenated derivative); and would undergo methylation at the 5-position very slowly, if at all, by means of diazomethane. In fact, some of the evidence suggests that citronin might conceivably be a dihydrochalcone similar to phloridzin.

Finally, it should be mentioned that botanical variations might account for the difference in the results of Yamamoto and Oshima and ourselves. Dr. W. P. Bitters has pointed out to us that there are two forms of the Ponderosa lemon, one of American origin (used in the present work) and the other of Javanese origin, which are undoubtedly of slightly different genotypes but of very similar phenotypes.

We should like to thank Dr. Bitters and Dr. W. B. Sinclair of the Citrus Experiment Station, University of California, Riverside, for their kindness in providing us with authentic Ponderosa lemons.

Robert M. Horowitz
Bruno Gentili

Fruit and Vegetable Chemistry Laboratory,
Western Utilization Research and
Development Division,
Agricultural Research Service,
Pasadena.

[1] Yamamoto, R., and Oshima, Y., *J. Agr. Chem. Soc. Japan*, **7**, 312 (1931).
[2] Zemplén, G., and Tettamanti, A. K., *Ber.*, **71**, B, 2511 (1938). Horowitz, R. M., and Gentili, B., Abstr. 135th meeting of the American Chemical Society, April, 1959, p. 7 D.
[3] Swingle, W. T., "The Citrus Industry", **1**, ed. Webber, H. J. and Batchelor, L. D., 393 (University of California Press, Berkeley and Los Angeles, 1943).
[4] Webber, H. J., *ibid.*, 605.
[5] Horowitz, R. M., *J. Org. Chem.*, **21**, 1184 (1956).
[6] Horowitz, R. M., *J. Amer. Chem. Soc.*, **79**, 6561 (1957).
[7] Kolle, F., and Gloppe, K., *Pharm. Zentralhalle*, **77**, 421 (1936). Karrer, W., *Helv. Chimica Acta*, **32**, 714 (1949).
[8] Wan, L. K., *J. Pharm. Soc. Japan*, **62**, 466 (1942).