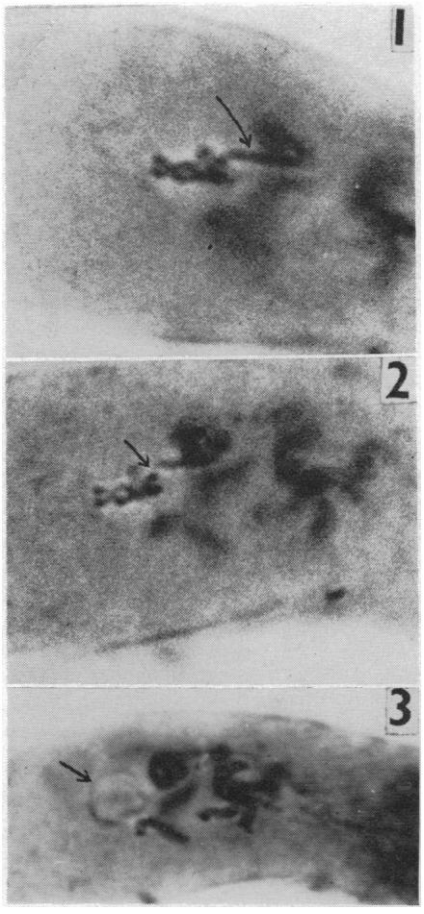

Fig. 1. Part of a basidium showing nucleolar chromosome in diplotene with its long arm (arrow) in full focus and its satellite zone partly in focus. (About × 4040.) Fig. 2. Same as Fig. 1, with short arm in full focus, showing satellite zone and interstitial chiasmata; arrow indicates possible location of centromere. (About × 3760.) Fig. 3. Same as Figs. 1 and 2, showing relative position of the nucleolus (arrow). (About × 1880)

nucleolus has been observed to cover the short arm of the chromosome in its entirety (Fig. 3). It seems likely that the nucleolus is organized by the so-called nucleolar constriction region of the chromosome. Matsuura (*6*) has distinguished two types of nucleolar chromosomes in the higher plants: the interstitial type and the terminal type. The nucleolar chromosome observed in *S. gentilis,* if this distinction is followed, belongs to the interstitial type.

As is well known, the morphological features of this chromosome are better revealed in the plant cells. The fungal nuclei have been considered by some investigators, such as Olive (*7*), to be more or less similar to those of the higher plants. The finding of a nucleolar chromosome with distinctive morphology of its own would appear to substantiate this view.

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4. The abbreviation "SAT" signifies, in addition to "satellite," "*sine acido thymonucleinico*" (without thymonucleic acid); since it has both connotations, the abbreviated form "SAT-zone" is widely used in current cytological literature.
5. I am indebted to the National Institute of Sciences of India for awarding me a research fellowship during the tenure of which this work was performed. Grateful acknowledgments are also due to Dr. S. P. Agharkar for laboratory facilities and encouragement, to Drs. M. J. Thirumalachar and G. B. Deodikar for helpful suggestions, and to Dr. S. H. Tulpule for furnishing advice and literature on cytology.
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Histochemical Localization of Acid Phosphatase in Bone Tissue

Analysis of the histochemical distribution of an enzyme is a valuable method for understanding and interpreting its physiological role. There is an extensive series of papers on the histochemical distribution of alkaline phosphatase in bone tissue, especially on its distribution during bone formation (*1*), and on the basis of these data and others of a biochemical character, some hypotheses have been put forward with respect to the action of alkaline phosphatase—namely, that its action takes place preponderantly in the cartilaginous calcification and formation of bone matrix and its later calcification.

Biochemical data exist relative to the presence of acid phosphatase in bone tissue; the increase of acid phosphatase in metastasic zones of some carcinomas (carcinoma of the prostate, for example) accompanied by a rise in the level of this enzyme in serum is known (*2*).

Although the histochemical localization of acid phosphatase in diverse tissues and organs has been investigated, because of technical difficulties, its localization in calcified tissues has not been studied in detail.

Recently we made a thorough analysis to establish the basic conditions for making a correct decalcification of bone tissue in order to show the above-mentioned enzyme. On the other hand we proved that the technique for demonstrating this enzyme could not be applied if even a vestige of calcium remained in the slides; chelating agents were tried but with no success.

Following these studies, we started a systematic study of the histochemical distribution of this enzyme in the normal ossification processes in man, rats (stock), and mice (strains C_3H and BAL). Numerous pathological specimens showing osteogenic phenomena and destruction of bone tissue were also used. All the material was treated, after being fixed in neutral 10-percent formalin for 24 hours at 4°C, in a buffer solution of 5-percent formic acid and 20-percent sodium citrate in equal parts, during a preliminary period, until all calcium was eliminated. Later on a modification of Gomori's technique (*3*) and the azo-dye method recently developed by Burton (*4*) were used on the frozen sections. The two techniques gave comparable results insofar as topographic and histological localization was concerned, and the differences in details of secondary importance, of a cytological order, were minimal.

Acid phosphatase was shown to be present in large quantities in the giant cells found in the proximity of erosive bone surfaces (osteoclasts) and cartilaginous surfaces (chondroclasts); we also found large quantities of enzyme in the walls of the vessels adjacent to erosive surfaces. The behavior of the enzyme was similar in the three species studied. In the pathological cases, an association of this enzyme with areas of bone reabsorption was evident, the enzyme being also found in abundance in the multinuclear giant cells of giant cell tumors and other related processes—cells which show a relationship to osteoclasts, even though this be only morphologic (Fig. 1).

In conclusion, we can report that, by using an adequate technique for decalcification, it is possible to show, easily and in a consistent and regular fashion, acid phosphatase in the hard tissues,

Fig. 1. Enchondral ossification zone in the limb of a newborn infant [Gomori's acid phosphatase techniques (frozen section); incubation time, 10 minutes]: (*a*) proliferating cartilage; (*b*) hypertrophic and calcified cartilage; (*c*) bone trabeculae in formation. The most intense enzymatic activity is observed in chondroclastic (*d*) and osteoclastic (*e*) cells. The hypertrophic and calcified zone is lacking in enzyme. (× about 120)

where it is intimately related to the areas of reabsorption; it should therefore be considered that this enzyme plays an important part in this mechanism.

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24 December 1957

Transmission of Internal Cork of Sweet Potato by the Cotton Aphid, Aphis gossypii Glover

Rankin (*1*) reported that *Myzus persicae* (Sulzer) and other aphids are probable vectors of internal cork of sweet potato. However, results from repeated tests with *M. persicae* were not always consistent when roots from test plants were indexed after one season. Hildebrand and Smith (*2*) reported aphid transmission of internal cork; they used various leaf symptoms as criteria of the disease. Sheffield (*3*) reported a disease of sweet potato from East Africa which she designated virus B and suggested its similarity to internal cork of sweet potato in the United States. She reported spread of this disease from sweet potato to sweet potato by the white fly, *Bemisia tabaci* (Genn).

Because *Myzus persicae* is virtually absent in sweet potato fields of Louisiana when much of the infection takes place, an intensive study was begun in 1955 to find a vector responsible for spread of the disease. The prevalence and occurrence of insects associated with sweet potatoes in the mother beds and in the fields was determined in 1956 and 1957. Weekly collections of aphids were made on tanglefoot traps placed in fields 1 foot above the growing vines (*4*). Insects also were collected from vines in the major sweet-potato-growing areas at weekly intervals.

Aphid species coinciding in greatest numbers with plant infection (*5*) were the cotton aphid, *Aphis gossypii* Glover, and the cowpea aphid, *Aphis medicaginis* Koch, other species being relatively few in number. When these two species of aphids were caged on sweet potato leaves, all cowpea aphids perished within 24 hours. The cotton aphids showed signs of discontent, with much probing and moving about. Nevertheless, they managed to survive for 7 to 10 days but did not reproduce. From these and other data it was surmised that the cotton aphid might transmit a virus of a nonpersistent nature in the vector (*6*) from sweet potato to sweet potato.

The following tests were made to determine the possible relationship of certain insect species to transmission of the disease. Eleven insect-proof cages made of 32-by-32-mesh Saran screen were used. Under each cage four cork-free plants (*7*) and one cork-affected plant were set on 9 August 1956. Insects were released into the cages during the first week of September. The species used and the number released per cage are shown in Table 1. In some cages combinations of certain species of insects were used in an attempt to obtain data on a possible complex of viruses. Plant material for 1957 plantings was obtained by cutting vines from the plants in each treatment prior to freeze injury in December 1956. These vines were maintained in the greenhouse until plants were set in June 1957. Some of these plants were grown in the field and were, therefore, subject to infestation by various insect species. The remainder were grown in a 32-by-32-mesh Saran screenhouse free from insects.

Results of these tests (the root-lesion indexing method was used for determining internal cork) are given in Table 1. The data clearly demonstrate that *Aphis gossypii* transmitted an agent, or agents, which resulted in the development of internal cork lesions in the roots of a cork-free stock of the Unit I Porto Rico variety of sweet potato. This was the only species involved which was capable of transmission of the disease under the conditions of this test. Furthermore, the data indicate that virus concentration in the plant must reach a high threshold level before lesions develop extensively in the roots.

Work is continuing to determine whether other viruses and insect species may be involved. It is considered possible that more than one virus may be present before cork lesions appear in the roots.

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Table 1. Data showing transmission of internal cork of sweet potato by the cotton aphid. Roots were examined for cork lesions by slicing into transverse section approximately 1/16 in. thick. For comparative purposes, the mean percentage of roots with lesions from originally cork-affected plants in each cage was determined (20 percent in 1956; 24 percent in 1957).

Insect species used	Grown in 1956			Grown in 1957			
				Uncaged field planting		Caged in screenhouse	
	Cages in 1956 (No.)	Roots examined (No.)	Roots with lesions (%)	Roots examined (No.)	Roots with lesions (%)	Roots examined (No.)	Roots with lesions (%)
50 *Aphis gossypii* + 100 *Empoasca* spp.	1	16	6.3	60	5.0	3	0
50 *Aphis gossypii* + 15 *Draeculacephala* sp.	1	10	0	75	9.3	6	50.0
50 *Aphis gossypii*	3	47	4.3	252	7.5	85	23.5
100 *Empoasca* spp.	2	19	0	123	3.3	29	0
15 *Draeculacephala* sp.	1	13	0	25	0	6	0
100 White flies, unidentified, from *Jacquemontia* sp.	1	16	0	83	2.4	5	0
None—check	2	43	0	190	1.6	26	0

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14 March 1958