were observed, and the chromosomes were clearly stained with acridine orange (Fig. 2). These observations were not changed by washing the cells with saline. Similar results were obtained with Ehrlich ascites cells in culture and random pure cultures of bacteria.

Much evidence exists that acridine orange and other acridine dyes become attached to nucleic acid. *In vitro*, a strong affinity exists between nucleic acids and the acridine orange[9]. *In vivo*, nuclear staining with acridine orange has been felt by other authors to represent nucleic acid staining[2,10]. The dye is strongly basic (*pK* 10·1), whereas deoxyribonucleic acid has many acidic groups, and nucleoprotein is basic. In fixed tissues, the pattern of staining corresponds to the chromatin pattern, and prior treatment with ribose and deoxyribose nucleases abolishes this staining[11]. Using synthetic and natural polynucleotides, Beers *et al.* have presented evidence that the phosphate groups of nucleic acid, particularly the terminal phosphates, are the site of attachment of acridine orange[12].

If we can accept this hypothesis that acridine orange does become attached to deoxyribonucleic acid, then we can reasonably suggest that this results in loss of spatial integrity of the deoxyribonucleic acid molecule. Our observations show clearly that this change does not result in alterations in cell division, deoxyribonucleic acid replication or protein synthesis.

It is hoped that further experiments will reveal some parameter of cellular function which is sensitive to the acridine dyes: perhaps some information concerning the intimate function of deoxyribonucleic acid in the cell may be thus uncovered.

This investigation was supported by a grant from the U.S. Public Health Service *C*2928 (*C*2).

Rolla B. Hill, jun.,
Klaus G. Bensch,
Donald W. King

Department of Pathology,
Yale University School of Medicine,
New Haven, Connecticut.

[1] DeRobertis, E. D. P., Nowinski, W. W., and Saez, F. A., 'General Cytology', 332, 2nd edit. (W. B. Saunders Co., Philadelphia, 1949).
[2] DeBruyn, P. P. H., *et al.*, *Exp. Cell Res.*, **4**, 174 (1953).
[3] Levin, E., Albert, S., and Johnson, R. M., *Arch. Biochem.*, **64**, 272 (1956). Loeser, C. N., *Anat. Rec.*, **116**, 327 (1953).
[4] Vinegar, R., *Cancer Res.*, **16**, 900 (1956).
[5] Ephrussi, B., and Hottinguer, H., *Nature*, **166**, 956 (1950).
[6] Denes, G., Kramer, M., and Polgar, L., *Acta Physiol. Hung.*, **12**, 13 (1957). Ledinko, M., *Virology*, **6**, 512 (1958).
[7] Hill, jun., R. B., and King, D. W., Fed. Proc., **18**, 1894 (1959).
[8] Hill, jun., R. B., *et al.*, *Nature*, **183**, 1818 (1959).
[9] Morthland, F. W., DeBruyn, P. P. H., and Smith, N. H., *Exp. Cell Res.*, **7**, 201 (1954). Steiner, R. F., and Beers, R. F., *Arch. Biochem. Biophys.*, **81**, 75 (1959).
[10] Joshi, U. N., and Korgaonkar, K. S., *Nature*, **183**, 400 (1959).
[11] Armstrong, J. A., *Exp. Cell Res.*, **11**, 649 (1956).
[12] Beers, R. F., Hendley, D. D., and Steiner, R. F., *Nature*, **182**, 242 (1958).

FORESTRY

Limitations Imposed by some Water-borne Preservatives on the Soil Block Test Method for Timber

When loss of weight is used as the criterion for fungal attack of treated blocks of timber tested by the soil block method the precise value of the threshold concentration of preservative is often obscured by extraneous losses of weight in sound blocks.

With creosote and oil-solvent preservatives this loss is due to the volatilization of some of the preservative or carrier during the exposure period and as these losses are fairly constant they can be discounted when assessing the results.

With water-borne preservatives such losses are found only with some salts, and an investigation into the cause of this has shown it to be due to soluble salt removal by diffusion. For such diffusion to occur it is generally accepted that the moisture content of the treated blocks should rise above fibre-saturation point and this has been shown to occur when the preservative used does not become thoroughly fixed in the wood or when a soluble salt is formed as a by-product of the fixation reaction.

Table 1

Preservative	Dry salt retention (lb./cu. ft) 0	0·09	0·18	0·35	0·7	1·4
	Moisture Content (Percentage oven-dry wood weight)					
Copper-chrome-arsenate (oxides)	28	30	29	29	29	29
Copper-zinc-chrome-arsenate (oxides)	30	30	29	30	29	30
* Copper-chrome-arsenate ($CuSO_4$ & $K_2Cr_2O_7$)	29	32	37	41	43	62
Fluor-chrome-arsenate-phenol	29	—	34	43	62	92
Boric acid	31	30	32	34	38	79

* In this formulation the potassium and sulphate ions take no part in the fixation reactions and presumably remain in the wood as a soluble salt.

Table 1 shows moisture contents obtained in blocks treated with five commercial preservatives to retentions ranging from 0·09 to 1·4 lb. per cu. ft. dry salt and incubated in sterile soil jars for 4 weeks. (The moisture content of all blocks before incubation was 10 per cent.)

If the treated blocks are well leached with running water prior to incubation no moisture build-up occurs with any of the preservatives tested.

Further tests showed that this increase in moisture content was obtained over a wide range of soil moistures and that the greater part of the moisture taken up came from the atmosphere above the soil rather than by moisture absorption directly from the soil. Hygrometer readings in this atmosphere showed that full saturation is approached at all soil moistures above the equilibrium moisture content of the soil (2–3 per cent with the soil used) at the temperature of incubation and that it is maintained as long as there is any surplus moisture in the soil.

The diffusion of salt from the treated blocks into the feeder strips subsequent to moisture build-up can be readily seen with highly coloured non-fixed salts such as dinitrophenol and has been checked by chemical analysis in the case of boric treated blocks.

The implications of this phenomenon in relation to non-fixed, unleached preservatives are two-fold.

First each retention of each preservative creates its own micro-environment so that results obtained from these are not strictly comparable. In the extreme cases the moisture content can become so high that fungal development could be limited by lack of aeration alone.

Secondly, salts can be removed by diffusion from the treated blocks causing weight losses of unknown magnitude. This migration may also inhibit fungal development in the feeder strips and underlying soil.

A more detailed report of this study is being made and will be reported elsewhere.

A. J. McQuire

Forest Research Institute,
Rotorua, New Zealand.
July 21.

[1] Leutritz, J., jun., *Bell System Tech. J.*, **25** (1956).