Chapter Ten

THE NON-SPECIFIC NATURE OF DEFENSE IN BARK AND WOOD DURING WOUNDING, INSECT AND PATHOGEN ATTACK\textsuperscript{1,2}

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1\textsuperscript{Studies of Periderm, IX. See reference 35 for Part VIII

2Part of the research reported here was carried out under a University of British Columbia and Canadian Forestry Service cooperation project while the author was seconded (1967-1973) to Faculty of Forestry, UBC.

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F. A. Loewus et al. (eds.), \textit{The Structure, Biosynthesis, and Degradation of Wood}
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INTRODUCTION

Lack of knowledge of the nature of a host response when attacked by a pathogen is the major factor contributing to the inadequate understanding of disease. In this chapter, evidence is presented to show that whenever the functioning of tissues essential to a tree is affected, regardless of cause, non-specific autonomous processes are triggered: of the three processes described here, two involve restoration of vital lateral meristems, namely, the phellogen and the vascular cambium, and the third, blocking of conductive sapwood. These processes involve dynamic metabolic and anatomical alterations, and once triggered, occur automatically in pre-existing totipotent cells.

Understanding the sequence of these alterations would be greatly enhanced if it were possible to compare them, by direct observation, with the normal chemical state of cells. Fluorescence, commonly used in identification procedures in chromatography, was a convenient choice to begin such investigations. We were able to avoid losses and changes of chemicals associated with usual histological techniques by freezing tissues under appropriate conditions, cutting frozen sections and examining them while still frozen by fluorescence and other optical microscopy techniques.

Cork cambium (phellogen) is a tissue essential to trees because it accommodates circumferential growth through seasonal renewal of the impervious outer covering, the phellem. Phellogen is the first living tissue affected during penetration by pathogens. The cryofixation technique showed that whenever phellogen becomes non-functional, regardless of cause, the autonomous process of phellogen restoration, constituting the host component in host-pathogen interactions, is initiated. The process of phellogen restoration entails the formation of periderms of the necrophylactic category. Wound periderm has been assigned only a passive role in defense because the process of its formation before the establishment of phellogen had remained little understood due to technological limitations. According to our findings, phellogen restoration, involving necrophylactic periderm

*Pathogen is defined as any agent (microbe, insect, parasitic plant) which causes chronic physiological disorders (pathogenesis) in the host.