

A larger amount of exudate was found accompanying the wound when it was covered with SACCHACHITIN membrane. Furthermore, since chitin is able to attract an accumulation of polymorphonuclear white cells, a blue layer composed of cells involved in acute inflammation was found underneath the SACCHACHITIN dressing on day 4 during the implantation study. It appears likely that chitinase released by dead, active, or disintegrated granular white cells might be responsible for the disintegration of the SACCHACHITIN membrane. The debris from this disintegration was possibly eliminated mainly by macrophages. Along with drying of the wound, a solidified crust gradually formed and blocked the SACCHACHITIN membrane at the edges. Therefore, the main influence of the SACCHACHITIN membrane on the wound might be during the first few days. Furthermore, the disintegration of the SACCHACHITIN membrane by granulocytes might be a potential reason for the acceleration of the wound-healing process.<sup>27</sup>

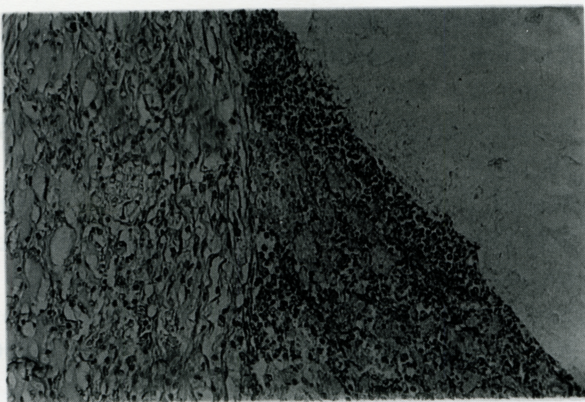
Except for controlling infection and eliminating dead tissue, granulocytes have no obvious influence on the wound-healing process.<sup>28</sup> In a study on comparing the effect of GM-CSF and G-CSF on wound healing, GM-CSF simultaneously increased the number of both granulocytes and macrophages resulting in an acceleration of the wound-healing rate. Although G-CSF increases the number of granulocytes, it has no effect on the number of macrophages or the wound-healing rate.<sup>29</sup> Furthermore, for those patients with a

low white cell count, the tolerance of wounds to tension during the healing process was found to be maintained normally. On the contrary, it has been recognized that macrophages play a more important role in the wound-healing process.<sup>21,27,30,31</sup> Not only are they involved in phagocytosis of foreign substances and the expression of antibodies, but secretion of cytokines by macrophages can also influence several different kinds of cell function. In the implantation study, an abundance of macrophages was found in the wound area covered with the SACCHACHITIN membrane. It would thus be reasonable to assume that the healing effect of SACCHACHITIN membrane on the wound was due to the activation of macrophages. The literature provides further evidence that chitin is able to activate as well as to enhance the function of macrophages.<sup>18,32</sup> In addition, it has been shown that chitin influences the epithelial cells of blood vessels, lymphocytes, fibrous cells, and the secretion of cytokines. Since the SACCHACHITIN membrane is similar in terms of chemical structure to glycosaminolytans, it may serve in guiding the reconstruction of the connective tissue.<sup>33</sup> All in all, the accelerating effects of SACCHACHITIN membrane on the wound-healing process can be attributed to an integrated response of all these functions.

## CONCLUSIONS

In conclusion, a minor inflammatory reaction to-

(a)



(b)

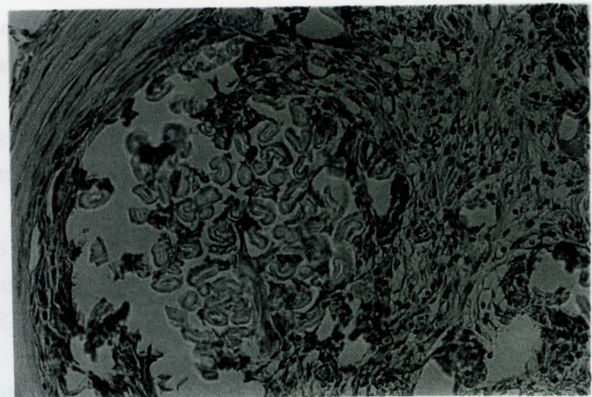


Fig. 7. Photomicrographs ( $\times 100$ ) of an acute inflammation response of the wound area to SACCHACHITIN membrane (a) and a foreign substance reaction of the wound area to gauze (b).