

active substances must become manifest within one year following cessation of work with these substances (Laborde). It is obvious that such restrictions are apt to defeat the purpose of the law and the moral background of the legislation in many cases of radium poisoning, especially where osteogenic neoplasms are concerned.

C. ROENTGEN-RAYS

Occupational exposure to roentgen-rays has not given rise to the development of osteogenic sarcomas, according to the information available. It is not likely that such lesions will result under the conditions of exposure prevailing under ordinary circumstances, as the type and amount of rays entering the body are not suitable and sufficient to elicit neoplastic responses in the deep-seated osseous tissues.

There exists satisfactory clinical and experimental evidence attesting that roentgen-rays may elicit such reactions under proper conditions of exposure. There are first the sclerotic and porotic responses of the osseous tissue to roentgen irradiation, known as radiation osteitis and representing, as seen in the radium sarcomas, a preparatory stage for malignant sequelae. The occurrence of an appreciable number of osteogenic sarcomas, originating from the irradiated tissue of tuberculous joints subjected for therapeutic reasons to an intense treatment with roentgen-rays, provides additional evidence of the cancerigenic effects which this form of radiating energy may exert upon the osseous tissue (Beck; Brandt; Brandes; Baumann; Martin; Pförringer; Deuticke; Küttner; Heidrich; Hellner; Becker; Bancklund; and Hanke and Neuhaus). Osteoid and chondroid elements were found in the spindle cellular or polymorphous cellular sarcomas developing on this basis and exhibiting a marked degree of malignancy. The latency period in a series of 17 cases was from five to eleven years and the development of the neoplastic process ensued at a time, when the tuberculous changes had healed completely. In view of this and considering that the sarcomas develop from the tissue of the epiphyseal line, as they are usually composed of chondro-fibro-osteoid tissue, and not from somewhere within the large area of injured tissue, it is probable that the tuberculous process plays a nonspecific, minor, contributory and preparatory rôle in the genesis of these neoplasms. These therapeutic roentgen-sarcomas of the bone affect most often the knee joint of young individuals (Becker). For these reasons, Hellner cautioned against the subjection of the epiphyseal tissue to a prolonged and intense roentgen-irradiation.

Similar neoplastic responses of the bony tissue have been elicited by roentgen-irradiation in animals. Lüdin, who exposed the tibia of a rabbit to a total of 8,000 r delivered in 40 treatments given in five day intervals, obtained after six and a half months an osteolytic chondrosarcoma. Lacassagne and Vinzent observed the development of an osteogenic sarcoma in the femur of a rabbit six and a half months after the irradiation of a bacterial abscess produced adjacent to this bone with roentgen-rays (1,000 r). A periosteal fibrosarcoma