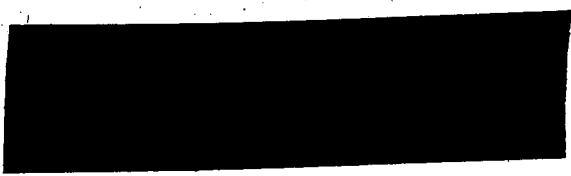


DEEP VISCERAL HYPERTHERMIA IN MAN  
WITHOUT SURFACE TISSUE INJURY



There is mounting evidence that radio frequency hyperthermia  $\bar{>}$  42°C is tumoricidal in cell cultures, animal models and human tumors. Most research has been limited to superficial tumors, since electromagnetic energy is ordinarily preferentially absorbed in surface tissue, causing surface burns.

Our studies on dogs and sheep showed that at least 3 watts/cm<sup>2</sup> was necessary to achieve deep internal hyperthermia, and while no preferential heating occurred in any animal normal viscera from 37-49°C, surface burns did occur using standard methods.

Surface cooling resulted in efficient internal heating, and with proper dose duty cycling, effective deep hyperthermia was possible in pigs with 3 cm. rine. However, in humans with  $\bar{>}$  1 cm. subcutaneous tissue, potentially effective deep hyperthermia resulted in surface burns despite surface cooling to 5°C.

Our development of a fundamentally new radio frequency device which allows uniform heating to any depth without surface injury has allowed evaluation of both superficial and internal tumors. Of 52 human tumors evaluated (25 surface, 27 visceral), temperature  $\bar{>}$  42°C occurred in 42 (81%),  $\bar{>}$  45°C in 23 (44%) and  $\bar{>}$  50°C in 19 (37%), with surface and adjacent normal tissues remaining at physiologic temperatures.

These data suggest that with proper instrumentation, hyperthermic investigation may now safely progress regardless of tumor location.