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A MULTICOUPLE PROBE FOR GRADIENT TEMPERATURE MEASUREMENT IN BIOLOGICAL MATERIALS.

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An easy-to-make, sensitive, thin flexible multi-sensor probe for *in-vivo* tissue temperature profile measurement is described. It is essentially a multi-junction thermocouple (i.e. a multicouple) of type T composition. Enamel insulated copper wires (38 gauge) were soldered 5 mm apart to one common uninsulated constantan wire (36 gauge) and introduced into a polyethylene tube sealed at one end. The total outside diameter of the multicouple probe is less than 1 mm and the maximum number of junctions using the specified wire sizes is approximately sixteen. This design permits the instantaneous measurement of a tissue temperature profile at 5 mm intervals over a distance of about 8 cm. An extensive calibration for the thermal conductivity effect (R-effect) along the multicouple wires using a limb model is presented. The results show that the temperature readings of the individual junctions are significantly affected by the R-effect when a thermal gradient exists along the multicouple, as is usually the case during tissue temperature measurement. However, calibration of the multicouple for the R-effect yields a measurement accuracy of ±0.1°C under a wide range of gradients. This probe can be implanted in tissue to measure thermal gradients under different physiological conditions.