ABSTRACT

Microwave effects on living systems can be broadly divided into three distinct groups, namely,

1. Thermal effects
2. Thermal but non-burn effects
3. Athermal effects

Attempts are made here to identify and quantify thermal-nonburn effects by analysing individual physio-anatomical systems (such as embryo in utero, ocular systems and implanted devices) which are hazard-prone and are susceptible to damage under exposure to non-ionizing radiations.

Concerning non-burn damage to the ocular system, a theoretical evaluation of microwave-induced temperature distribution in the eye is presented and consequent detrimental thermoelastic stress-strain and vibration parameters are determined. The resulting hazardous effects are quantified in terms of damage function and thermal shock resistance coefficient.

Further effects of microwaves on embryonic development in human beings are studied through functional changes during gestation when a subject is exposed to radiations. Approximate models of the uterus at various stages of fetal growth are developed for this purpose and the effects of microwaves on oxygen consumption characteristics of placenta are studied. Relevant risk
A non-burn damage that microwave radiation could cause on implanted devices such as a cardiac pacemaker is studied using thermoelastic theory. Thereby, effective blocking of the implanted pacing activity due to absorbed microwave dosage is explained.

Apart from the above mentioned thermal non-burn effect, involving thermoelastic phenomenon, other possible thermally induced non-burn injuries that could arise from thermoconvection and fluid dynamical activities in biofluid systems are also discussed, and mathematical modelling of intra-uterine thermo-convection processes under the influence of non-ionizing radiations is indicated as an example. Suggestions to analyse these models to explain some of the microwave versus living-system interactions are presented.