Evidence for the existence of an inducible response to DNA damage in mammalian cells is accumulating [1,2,3 and references therein]. We have further investigated this concept by exposing cultured Chinese hamster ovary (CHO K1) cells to X-rays (500 cGy - heat generation is negligible at 0.9pg/ml), followed by detection of changes in the pattern of protein synthesis/gene expression using the well characterized 'heat shock' stress response in mammalian cells may deal with radiation damage by using some of the same protective/repair mechanisms as for other environmental stresses. 200 cGy of X-rays was reported to induce shock proteins in mammalian cells and to modify the cellular response to hyperthermia, thus implicating the involvement of HSPs, although the full details were not disclosed [4].

The findings reported here also appear to tally well with with those of Herrlich et al. [5] who reported that V 79 hamster fibroblast cells responded to 438 cGy of alpha particle radiation by elevating the synthesis of two proteins with molecular masses of 60 and 40 kDa [5]. However, changes in the expression of HSPs were not reported in that study. Boothman et al. [2] reported eight major XIPs appearing 3 h after treatment, with molecular masses in the range 126 - 275 kDa, in human malignant melanoma cells at a dose of 300 cGy. The kinetics of XIP induction was consistent with a role in PLDR and/or X-ray adaptation [2]. (Partial cDNA sequence data now indicates that four of the XIPs may correspond to tissue type plasminogen activator, DT-diaphorase, int-1 and thymidine kinase [8]). In contrast to these results we did not find any XIPs in this high molecular mass range.

Chronic exposure of rats to DEN was reported to result in elevated transcription of HSP 83 in the liver [6]. It was proposed that during carcinogen treatment the heat shock genes participate along with c-H-ras and c-myc in a change that leads to resistance to the cytotoxic effects of a variety of cells toxins. Rat HSP 83 corresponds to HSP 90 in CHO cells (see [7]), however, we did not observe an increase in HSP 90 after overnight exposure to DEN.

References