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Saving animal lives by tests on bacteria

Editorial

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We have recently demonstrated that homocysteine thiolactone and its alpha methylated derivative increased the survival of bacteria E. coli AB 1157 after gamma irradiation (Mao et al., 1994). E. coli were grown in peptone yeast medium (1% tryptone, 0.5% yeast and 0.5% NaCl, pH 7.0) and harvested at the exponential phase. After washing in buffered saline the bacterial suspension was irradiated in test tubes in the presence of air or Argon. A Co 60 gamma source (Gammacell 220, Nordion, Canada) with a dose rate of 80 Gy/min was used for the experiments. After irradiation bacteria were harvested and diluted to aliquots of 100 bacteria per 100 μl and put onto agar plates. Colonies were counted after incubation over night at 37°C. The survival curve under aerobic conditions (Fig. 1) shows that alpha methyl homocysteine thiolactone (curve C) was more effective than homocysteine thiolactone (B) read against buffer (A). The same pattern was found under Argon.

Parallel experiments were performed irradiating BALB/c mice, female, mean weight 20.0 g, mean age 8 weeks. Whole body irradiation was carried out with a dose of 6.06 Gy using a Crysobalt Co 60 gamma source. 21 mice were injected intraperitoneal 1 ml of isotonic sodium chloride 30 min prior to irradiation, 21 mice 100 mg/kg body weight homocysteine thiolactone and 21 animals 100 mg alpha-methyl-homocysteine thiolactone. The survival curves for irradiated mice are shown in Fig. 2 and demonstrate that the N/No (N = surviving mice, No is number of mice at the starting point) resembles the bacterial survival. Best survival was for alpha-methyl-homocysteine thiolactone (curve C) saving 12 out of 21 mice from letal irradiation followed by homocysteine thiolactone (B) saving 9 out of 21 mice. In the sodium chloride treated mice only 1 out of 21 survived the endpoint of observation of 28 days.

The mechanisms of action of sulfur containing radiationprotectors is still unclear. Current concepts favourize the free oxygen radical scavenging hypothesis, proton donation and the activation of repair mechanisms (Roberts, 1992). Our findings of radiation protection under Argon put the free oxygen radical

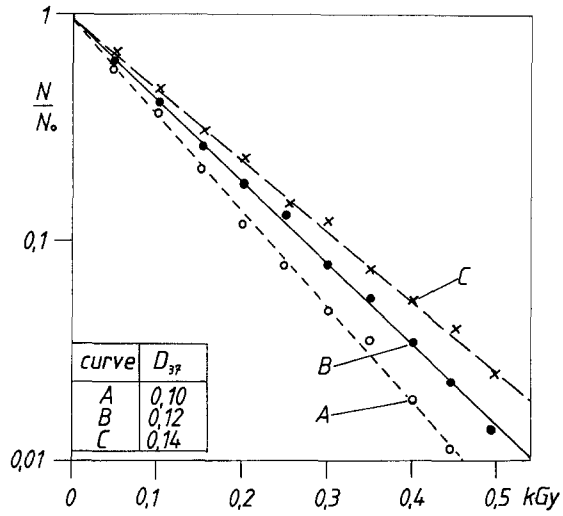

Fig. 1

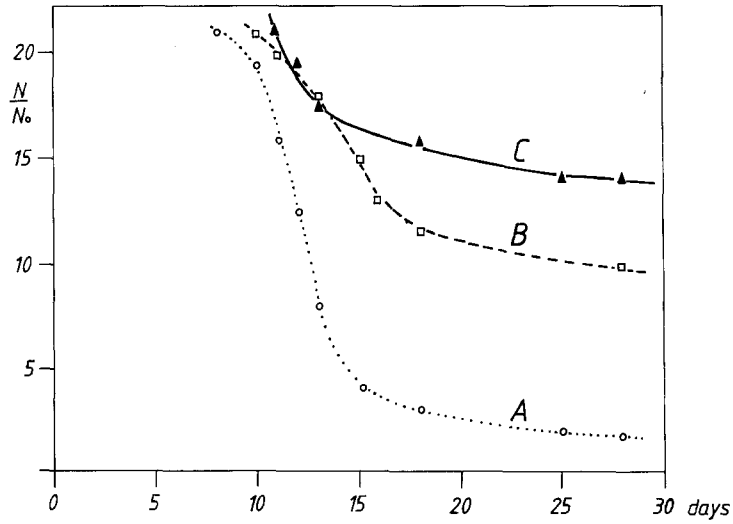

Fig. 2

scavenging hypothesis in question. The possibility to perform experiments in a biological system under Argon is another benefit of our methodology set up primarily to save animal lifes. It remains to be shown that the method proposed correlates with the animal system. The bacterial system should also allow testing scavengers for OH. and O2. species for other than radiation protection purposes. This may be a major application as there is a bulk of human diseases in which free oxygen radical damage is involved (Halliwell and Gutteridge, 1993). Our data although preliminary may indicate a way saving animal lives.

References

Halliwell B, Gutteridge JMC (1993) Free radicals in biology and medicine. 2nd edn., Oxford University Press, UK

Mao Y, Lubec G, Getoff N, Solar S, Quint RM (1994) The effect of homocysteine thiolactone and its alpha alkylated derivative on the survival of irradiated E coli AB 1157. Rad Phys Chem (in print)

Roberts J (1992) Amino acids and their derivatives as radioprotective agents. Amino Acids 3: 25–52

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