

## 6. References

- Abbatt, J.D. (1979) History of the use and toxicity of Thorotrast. *Environ. Res.*, **18**, 6–12
- Abelin, T., Averkin, J.I., Egger, M., Egloff, B., Furmanchuk, A.W., Gurtner, F., Korotkevich, J.A., Marx, A., Matveyenko, I.I., Okeanov, A.E., Ruchti, C. & Schaeppi, W. (1994) Thyroid cancer in Belarus post-Chernobyl: Improved detection or increased incidence? *Soz. Präventivmed.*, **39**, 189–197
- Adams, E.E., Brues, A.M. & Anast, G.A. (1983) Survey of ocular cataracts in radium dial workers. *Health Phys.*, **44** (Suppl. 1), 73–79
- Adamson, J.W., Fialkow, P.J., Murphy, S., Prchal, J.F. & Steinmann, L. (1976) Polycythemia vera: Stem-cell and probable clonal origin of the disease. *New Engl. J. Med.*, **295**, 913–916
- Aghamohammadi, S.Z., Goodhead, D.T. & Savage, J.R.K. (1988) Induction of sister chromatid exchanges (SCE) in G<sub>0</sub> lymphocytes by plutonium-238 α-particles. *Int. J. Radiat. Biol.*, **53**, 909–915
- Aghamohammadi, S.Z., Morris, T., Stevens, D.L. & Thacker, J. (1992) Rapid screening for deletion mutations in the hprt gene using the polymerase chain reaction: X-ray and α-particle mutant spectra. *Mutat. Res.*, **269**, 1–7
- Ahman, B. & Ahman, G. (1994) Radiocesium in Swedish reindeer after the Chernobyl fallout: Seasonal variations and long-term decline. *Health Phys.*, **66**, 503–512
- Akiyama, M., Umeki, S., Kusunoki, Y., Kyoizumi, S., Nakamura, N., Mori, T., Ishikawa, Y., Yamakido, M., Ohama, K., Kodama, T., Endo, K. & Cologne, J.B. (1995) Somatic-cell mutations as a possible predictor of cancer risk. *Health Phys.*, **68**, 643–649
- Akleyev, A.V. & Lyubchansky, E.R. (1994) Environmental and medical effects of nuclear weapon production in the Southern Urals. *Sci. total Environ.*, **142**, 1–8
- Akleyev, A.V., Kossenko, M.M., Silkina, L.A., Degteva, M.O., Yachmenyov, V.A., Awa, A., Akiyama, M., Veremeyeva, G.A., Vozilova, A.V., Kyozumi, S., Kozheurov, V.P. & Vyushkova, O.V. (1995) Health effects of radiation incidents in the Southern Urals. *Stem Cells*, **13** (Suppl. 1), 58–68
- Alavanja, M.C.R., Brownson, R.C., Lubin, J.H., Berger, E., Chang, J. & Boice, J.D., Jr (1994) Residential radon exposure and lung cancer among nonsmoking women. *J. natl Cancer Inst.*, **86**, 1829–1837
- Alavanja, M.C.R., Lubin, J.H., Mahaffey, J.A. & Brownson, R.C. (1999) Residential radon exposure and risk of lung cancer in Missouri. *Am. J. public Health*, **89**, 1042–1048
- Albert, R., Klevin, P., Fresco, J., Harley, J., Harris, W. & Eisenbud, M. (1955) Industrial hygiene and medical survey of a thorium refinery. *Arch. ind. Health*, **11**, 234–242
- Albertini, R.J., Castle, K.L. & Borcherding, W.R. (1982) T-cell cloning to detect the mutant 6-thioguanine-resistant lymphocytes present in human peripheral blood. *Proc. natl Acad. Sci. USA*, **79**, 6617–6621

- Albertini, R.J., Clark, L.S., Nicklas, J.A., O'Neill, J.P., Hui, T.E. & Jostes, R. (1997) Radiation quality affects the efficiency of induction and the molecular spectrum of *HPRT* mutations in human T cells. *Radiat. Res.*, **148**, S76–S86
- Anderson, E.C., Holland, L.M., Prine, J.R. & Thomas, R.G. (1975) Lung response to localized irradiation from plutonium microspheres. *Inhaled Part.*, **4**, 615–623
- Anderson, E.C., Holland, L.M., Prine, J.R. & Smith, D.M. (1979) Lung tumorigenesis in the Syrian hamster from particulate sources of  $^{147}\text{Pm}$   $\beta$  radiation. *Radiat. Res.*, **79**, 349–367
- Andersson, M. (1997) Long-term effects of internally deposited  $\alpha$ -particle emitting radionuclides. *Dan. med. Bull.*, **44**, 169–190
- Andersson, M., Carstensen, B. & Visfeldt, J. (1993) Leukemia and other related hematological disorders among Danish patients exposed to Thorotrast. *Radiat. Res.*, **134**, 224–233
- Andersson, M., Vyberg, M., Visfeldt, J., Carstensen, B. & Storm, H.H. (1994) Primary liver tumors among Danish patients exposed to Thorotrast. *Radiat. Res.*, **137**, 262–273
- Andersson, M., Carstensen, B. & Storm, H.H. (1995a) Mortality and cancer incidence after cerebral arteriography with or without Thorotrast. *Radiat. Res.*, **142**, 305–320
- Andersson, M., Wallin, H., Jönsson, M., Nielsen, L.L., Visfeldt, J., Vyberg, M., Bennett, W.P., De Benedetti, V.M.G., Travis, L.B. & Storm, H.H. (1995b) Lung cancer and malignant mesothelioma in patients exposed to Thorotrast: Incidence, histology and *p53* status. *Int. J. Cancer*, **63**, 330–336
- Andersson, M., Jönsson, M., Nielsen, L.L., Vyberg, M., Visfeldt, J., Storm, H.H. & Wallin, H. (1995c) Mutations in the tumor suppressor gene *p53* in human liver cancer induced by  $\alpha$ -particles. *Cancer Epidemiol. Biomarkers Prev.*, **4**, 765–770
- Anspaugh, L.R., Ricker, Y.E., Black, S.C., Grossman, R.F., Wheeler, D.L., Church, B.W. & Quinn, V.E. (1990) Historical estimates of external  $\gamma$  exposure and collective external  $\gamma$  exposure from testing at the Nevada Test Site. II. Test series after Hardtack II, 1958, and summary. *Health Phys.*, **59**, 525–532
- Archer, V.E., Magnuson, H.J., Holaday, D.A. & Lawrence, P.A. (1962) Hazards to health in uranium mining and milling. *J. occup. Med.*, **4**, 55–60
- Archer, V.E., Wagoner, J.K. & Lundin, F.E., Jr (1973) Cancer mortality among uranium mill workers. *J. occup. Med.*, **15**, 11–14
- Arndt, D., Mehnert, W.H., Franke, W.-G., Woller, P., Laude, G., Rockel, A. & Waller, M. (1994) Radioiodine therapy during an unknown remained pregnancy and radiation exposure of the fetus. *Strahlenther. Onkol.*, **170**, 408–414
- Arnold, W. & Weber, C. (1989) Radiation effects on the bone marrow of ankylosing spondylitis patients treated with radium 224. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology, pp. 29–31
- Astakhova, L.N., Anspaugh, L.R., Beebe, G.W., Bouville, A., Drozdovitch, V.V., Garber, V., Gavrilin, Y.I., Khrouch, V.T., Kuvshinnikov, A.V., Kuzmenkov, Y.N., Minenko, V.P., Moschik, K.V., Nalivko, A.S., Robbins, J., Shemiakina, E.V., Shinkarev, S., Tochitskaya, S.I. & Waclawiw, M.A. (1998) Chernobyl-related thyroid cancer in children of Belarus: A case-control study. *Radiat. Res.*, **150**, 349–356
- Auvinen, A., Mäkeläinen, I., Hakama, M., Castrén, O., Pukkala, E., Reisbacka, H. & Rytömaa, T. (1996) Indoor radon exposure and risk of lung cancer: A nested case-control study in Finland. *J. natl Cancer Inst.*, **88**, 966–972

- Auvinen, A., Makelainen, I., Hakama, M., Castrén, O., Pukkala, E., Reisbacka, H. & Rytömaa, T. (1998) Indoor radon exposure and risk of lung cancer: A nested case-control study in Finland. *J. natl. Cancer Inst.*, **90**, 401-402 (erratum)
- Bagg, H.J. (1922) Disturbances in mammalian development produced by radium emanation. *Am. J. Anat.*, **30**, 133-161
- Balonov, M.I., Muksinova, K.N. & Mushkacheva, G.S. (1993) Tritium radiobiological effects in mammals: Review of experiments of the last decade in Russia. *Health Phys.*, **65**, 713-726
- Balonov, M., Jacob, P., Likhtarev, I. & Minenko, V. (1996) Pathways, levels and trends of population exposure after the Chernobyl accident. In: Karaoglu, A., Desmet, G., Kelly, G.N. & Menzel, H.G., eds, *The Radiological Consequences of the Chernobyl Accident, Proceedings of the First International Conference, Minsk, Belarus, 18 to 22 March 1996* (EUR 16544 EN), Luxembourg, Office for Official Publications of the European Communities, pp. 235-249
- Bao, C.-Y., Ma, A.-H., Evans, H.H., Horng, M.F., Mencl, J., Hui, T.E. & Sedwick, W.D. (1995) Molecular analysis of hypoxanthine phosphoribosyltransferase gene deletions induced by  $\alpha$ - and X-radiation in human lymphoblastoid cells. *Mutat. Res.*, **326**, 1-15
- Baranova, A. & Osanov, D.P. (1990) The dependence of skin lesions on the depth-dose distribution from  $\beta$ -irradiation of people in the Chernobyl nuclear power plant accident. *Int. J. Radiat. Biol.*, **57**, 775-782
- Baranov, A., Gale, R.P., Guskova, A., Piatkin, E., Selidovkin, G., Muravyova, L., Champlin, R.E., Danilova, N., Yevseeva, L., Petrosyan, L., Pushkareva, S., Konchalovsky, M., Gordeeva, A., Protasova, T., Reisner, Y., Mickey, M.R. & Terasaki, P.I. (1989) Bone marrow transplantation after the Chernobyl nuclear accident. *New Engl. J. Med.*, **321**, 205-212
- Barnhart, B.J. & Cox, S.H. (1979) Mutagenicity and cytotoxicity of 4.4-MeV  $\alpha$  particles emitted by plutonium-238. *Radiat. Res.*, **80**, 542-548
- Baserga, R., Lisco, H. & Kisieleski, W.E. (1966) Tumor induction in mice by radioactive thymidine. *Radiat. Res.*, **2**, 583-596
- Bateman, A.J. & Chandley, A.C. (1962) Mutations induced in the mouse with tritiated thymidine. *Nature*, **193**, 705-706
- Bauchinger, M., Schmid, E., Braselmann, H. & Kulka, U. (1994) Chromosome aberrations in peripheral lymphocytes from occupants of houses with elevated indoor radon concentrations. *Mutat. Res.*, **310**, 135-142
- Bauchinger, M., Braselmann, H., Kulka, U., Huber, R. & Georgiadou-Schumacher, V. (1996) Quantification of FISH-painted chromosome aberrations after domestic radon exposure. *Int. J. Radiat. Biol.*, **70**, 657-663
- Bauchinger, M., Salassidis, K., Braselmann, H., Vozilova, A., Pressl, S., Stephan, G., Snigiryova, G., Kozheurov, V.P. & Akleyev, A. (1998) FISH-based analysis of stable translocations in a Techa River population. *Int. J. Radiat. Biol.*, **73**, 605-612
- Baugnet-Mahieu, L., Lemaire, M., Léonard, E.D., Léonard, A. & Gerber, G.B. (1994) Chromosome aberrations after treatment with radioactive iodine for thyroid-cancer. *Radiat. Res.*, **140**, 429-431
- Bäverstam, U. & Lagarde, F. (1999) The impact of measurement errors in exposure assessment for residential radon. A stochastic approach. In: Ron, E. & Hoffman, F.O., eds, *Uncertainties in Radiation Dosimetry and Their Impact on Dose-Response Analyses* (NIH Publication No. 99-4541), Bethesda, MD, National Cancer Institute, pp. 132-138

- Bäverstam, U. & Swedjemark, G.-A. (1991) Where are the errors when we estimate radon exposure in retrospect? *Radiat. Prot. Dosim.*, **36**, 107–112
- Baverstock, K.F. & Papworth, D.G. (1985) The UK radium luminiser survey: Significance of a lack of excess leukaemia. *Strahlentherapie*, **80**, 22–26
- Beasley, T.M., Palmer, H.E. & Nelp, W.B. (1966) Distribution and excretion of technetium in humans. *Health Phys.*, **12**, 1425–1435
- Beck, A. (1922) [On the question of X-ray induced sarcoma; a contribution to the pathogenesis of sarcoma]. *Munch. Med. Wochenschr.*, **17**, 623–625 (in German)
- Beling, U. & Einhorn, J. (1961) Incidence of hypothyroidism and recurrences following I<sup>131</sup> treatment of hyperthyroidism. *Acta Radiol.*, **56**, 275–288
- Belinsky, S.A., Swafford, D.S., Finch, G.L., Mitchell, C.E., Kelly, G., Hahn, F.F., Anderson, M.W. & Nikula, K.J. (1997) Alterations in the K-ras and p53 genes in rat lung tumors. *Environ. Health Perspectives*, **105**, 901–906
- Beral, V., Fraser, P., Carpenter, L., Booth, M., Brown, A. & Rose, G. (1988) Mortality of employees of the Atomic Weapons Establishment, 1951–82. *Br. med. J.*, **297**, 757–770
- Berglund, S. & Zettervall, O. (1992) Incidence of polycythemia vera in a defined population. *Eur. J. Haematol.*, **48**, 20–26
- Berk, P.D., Goldberg, J.D., Donovan, P.B., Fruchtman, S.M., Berlin, N.I. & Wasserman, L.R. (1986) Therapeutic recommendations in polycythemia vera based on Polycythemia Vera Study Group protocols. *Semin. Hematol.*, **23**, 132–143
- Berkovski, V. (1999) Radioiodine biokinetics in the mother and fetus. Part 2. Fetus. In: Thomas, G., Karaoglou, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer* (EUR 18552 EN), Singapore, World Scientific, pp. 327–332
- Berrett, A. & McRae, D.L. (1958) A follow-up study after Thorotrast carotid arteriography. *Can. med. Assoc. J.*, **78**, 916–921
- Berry, C.L., Amerigo, J., Nickols, C. & Swettenham, K.V. (1983) Transplacental carcinogenesis with radioactive phosphorus. *Hum. Toxicol.*, **2**, 49–62
- Bertelli, L., Oliveira, C.A.N., Lipsztein, J.L. & Wrenn, M.E. (1992) A case study of the transfer of <sup>137</sup>Cs to the human fetus and nursing infant. *Radiat. Prot. Dosim.*, **41**, 131–136
- Bhatia, A.L. & Sisodia, R. (1988) Neuromorphometrical changes in cerebral cortex of Swiss albino mice during postnatal development under HTO-exposure. *Radiobiol. Radiother.*, **29**, 717–727
- Bhatia, A.L. & Srivastava, P.N. (1982) Tritium toxicity in mouse testis: Effect of continuous exposure during pre- and postnatal development. *Strahlentherapie*, **158**, 752–755
- Biberman, R., Lusky, A., Schlesinger, T., Margalit, M., Neeman, E. & Modan, B. (1993) Increased risk for small cell lung cancer following residential exposure to low-dose radon: A pilot study. *Arch. environ. Health*, **48**, 209–212
- Bickel, A. (1913) [New contribution to thorium X therapy in anaemia, leukaemia and rheumatic diseases]. *Berl. klin. Wschr.*, **50**, 346–348 (in German)
- Bilbao, A., Prosser, J.S., Edwards, A.A., Moody, J.C. & Lloyd, D.C. (1989) The induction of micronuclei in human lymphocytes by *in vitro* irradiation with alpha particles from plutonium-239. *Int. J. Radiat. Biol.*, **56**, 287–292
- Birchall, A. & James, A.C. (1994) Uncertainty analysis of the effective dose per unit exposure from radon progeny and implications for ICRP risk-weighting factors. *Radiat. Prot. Dosim.*, **53**, 133–140

- Blanchard, R.L. (1967) Concentrations of  $^{210}\text{Pb}$  and  $^{210}\text{Po}$  in human soft tissues. *Health Phys.*, **13**, 625–632
- Bleuer, J.P., Averkin, Y.I. & Abelin, T. (1997) Chernobyl-related thyroid cancer: What evidence for role of short-lived iodines? *Environ. Health Perspectives*, **105** (Suppl. 6), 1483–1486
- Blöcher, D. (1988) DNA double-strand break repair determines the RBE of alpha-particles. *Int. J. Radiat. Biol.*, **54**, 761–771
- Blomberg, R., Larsson, L.E., Lindell, B. & Lindgren, E. (1967) Late effects of Thorotrast in cerebral angiography. *Am. N.Y. Acad. Sci.*, **145**, 853–858
- Blot, W.J., Xu, Z.-Y., Boice, J.D., Jr, Zhao, D.-Z., Stone, B.J., Sun, J., Jing, L.-B. & Fraumeni, J.F., Jr (1990) Indoor radon and lung cancer in China. *J. natl Cancer Inst.*, **82**, 1025–1030
- Blum, T. (1924) Osteomyelitis of the mandible and maxilla. *J. Am. med. dent. Assoc.*, **11**, 802–805
- Boecker, B.B., Muggenburg, B.A., Miller, S.C. & Brackley, P.L., eds (1994) *Biennial Report on Long-term Dose–Response Studies of Inhaled or Injected Radionuclides 1991–1993* (US Department of Energy Report ITRI-139), Springfield, VA, National Technical Information Service, pp. 126–129, 193–195
- Bogdan, G.M. & Aposhian, H.V. (1990) N-(2,3-Dimercaptopropyl)phthalimidic acid (DMPA) increases polonium-210 excretion. *Biol. Metals*, **3**, 232–236
- Bond, V.P., Fliedner, T.M. & Archambau, J.O. (1965) *Mammalian Radiation Lethality: A Disturbance in Cellular Kinetics*, New York, Academic Press
- Book, S.A. & Goldman, M. (1975) Thyroidal radioiodine exposure of the fetus. *Health Phys.*, **29**, 874–877
- Botchway, S.W., Stevens, D.L., Hill, M.A., Jenner, T.J. & O'Neill, P. (1997) Induction and rejoicing of DNA double-strand breaks in Chinese hamster V79-4 cells irradiated with characteristic aluminum K and copper L ultrasoft X rays. *Radiat. Res.*, **148**, 317–324
- Boulahdour, H. & Galle, P. (1998) Ultrastructural lesions in mammalian cells after neptunium-237 intoxication: Radiological or chemical lesions? *Scanning*, **20**, 193–194
- Bouville, A., Anspaugh, L., Balonov, M.I., Gordeev, K.I., Kiselev, V.I., Loborev, V.M., Luckyanov, N.K., Pauli, E., Robison, W.L., Savkin, M., Sudakov, V.V. & Zelentsov, S. (2000) Estimation of doses. In: Warner, F. & Kirchman, R.J., eds, *Nuclear Test Explosions: Environmental and Human Impacts*, New York, Wiley & Sons, pp. 115–177
- Bowlt, C. & Tiplady, P. (1989) Radioiodine in human thyroid glands and incidence of thyroid cancer in Cumbria. *Br. med. J.*, **299**, 301–302
- Boyd, J.T., Court Brown, W.M., Vennart, J. & Woodcock, G.E. (1966) Chromosome studies on women formerly employed as luminous-dial painters. *Br. med. J.*, **i**, 377–382
- Boyd, J.T., Langlands, A.O. & MacCabe, J.J. (1968) Long-term hazards of Thorotrast. *Br. med. J.*, **ii**, 517–521
- Brandom, W.F., McGavran, L., Bistline, R.W. & Bloom, A.D. (1990) Sister chromatid exchanges and chromosome aberration frequencies in plutonium workers. *Int. J. Radiat. Biol.*, **58**, 195–207
- Breitenstein, B.D., Jr & Palmer, H.E. (1989) Lifetime follow-up of the 1976 americium accident victim. *Radiat. Protect. Dosim.*, **26**, 317–322
- Bremner, W.F., McDougall, I.R. & Greig, W.R. (1973) Results of treating 297 thyrotoxic patients with  $^{125}\text{I}$ . *Lancet*, **ii**, 281–282

- Brenner, D.J. (1994) The significance of dose rate in assessing the hazards of domestic radon exposure. *Health Phys.*, **67**, 76–79
- Bridges, B.A., Cole, J., Arlett, C.F., Green, M.H.L., Waugh, A.P.W., Beare, D., Henshaw, D.L. & Last, R.D. (1991) Possible association between mutant frequency in peripheral lymphocytes and domestic radon concentrations. *Lancet*, **337**, 1187–1189
- Brincker, H., Hansen, H.S. & Andersen, A.P. (1973) Induction of leukaemia by  $^{131}\text{I}$  treatment of thyroid carcinoma. *Br. J. Cancer*, **28**, 232–237
- Britcher, A.R. & Strong, R. (1994) Personal air sampling — A technique for the assessment of chronic low level exposure? *Radiat. Protect. Dosim.*, **53**, 59–62
- Brooks, A.L., Rutherford, J.C. & McClellan, R.O. (1974) Effect of  $^{239}\text{PuO}_2$  particle number and size on the frequency and distribution of chromosome aberrations in the liver of the Chinese hamster. *Radiat. Res.*, **59**, 693–709
- Brooks, A.L., Benjamin, S.A., Hahn, F.F., Brownstein, D.G., Griffith, W.C. & McClellan, R.O. (1983) The induction of liver tumors by  $^{239}\text{Pu}$  citrate or  $^{239}\text{PuO}_2$  particles in the Chinese hamster. *Radiat. Res.*, **96**, 135–151
- Brooks, A.L., Guilmette, R.A., Hahn, F.F., Haley, P.J., Muggenburg, B.A., Mewhinney, J.A. & McClellan, R.O. (1992) Distribution and biological effects of inhaled  $^{239}\text{Pu}(\text{NO}_3)_4$  in cynomolgus monkeys. *Radiat. Res.*, **130**, 79–87
- Brooks, A.L., Khan, M.A., Jostes, R.F. & Cross, F.T. (1993) Metaphase chromosome aberrations as markers of radiation exposure and dose. *J. Toxicol. environ. Health*, **40**, 277–288
- Brooks, A.L., Bao, S., Harwood, P.W., Wood, B.H., Chrisler, W.B., Khan, M.A., Gies, R.A. & Cross, F.T. (1997) Induction of micronuclei in respiratory tract following radon inhalation. *Int. J. Radiat. Biol.*, **72**, 485–495
- Bruenger, F.W., Lloyd, R.D. & Miller S.C. (1991a) The influence of age at time of exposure to  $^{226}\text{Ra}$  or  $^{229}\text{Pu}$  on distribution, retention, postinjection survival and tumor induction in beagle dogs. *Radiat. Res.*, **125**, 248–256
- Bruenger, F.W., Taylor, D.M., Taylor, G.N. & Lloyd, R.D. (1991b) Effectiveness of DTPA treatments following the injection of particulate plutonium. *Int. J. Radiat. Biol.*, **60**, 803–818
- Bruenger, F.W., Lloyd, R.D., Miller, S.C., Taylor, G.N., Angus, W. & Huth, D.A. (1994) Occurrence of mammary tumors in beagles given radium-226. *Radiat. Res.*, **138**, 423–434
- Bulman, R.A. (1990) Interaction of chelation agents with bone. In: Priest, N.D. & Van De Vyver, F.L., eds, *Trace Metals and Fluoride in Bones and Teeth*, Boca Raton, FL, CRC Press, pp. 271–306
- Burch, P.R.J. (1959) Iodine-131 in human thyroids and iodine-131 and caesium-137 in milk. *Nature*, **183**, 515–517
- Burkart, W. (1996) Radioepidemiology of the aftermath of the nuclear program of the former Soviet Union: Unique lessons to be learnt. *Radiat. Environ. Biophys.*, **35**, 65–73
- Burki, H.J., Bunker, S., Ritter, M. & Cleaver, J.E. (1975) DNA damage from incorporated radioisotopes: Influence of the  $^3\text{H}$  location in the cell. *Radiat. Res.*, **62**, 299–312
- Bursian, S.J., Cahill, D.F., Laskey, J.W. & Parker, L.N. (1975) Some aspects of brain neurochemistry after intrauterine exposure to tritium. *Int. J. Radiat. Biol.*, **27**, 455–461
- Butland, B.K., Muirhead, C.R. & Draper, G.J. (1990) Radon and leukaemia (Letter to the Editor). *Lancet*, **335**, 1338–1339

- Buzhievskaya, T.I., Tchaikovskaya, T.L., Demidova, G.G. & Koblyanskaya, G.N. (1995) Selective monitoring for a Chernobyl effect on pregnancy outcome in Kiev, 1969–1989. *Hum. Biol.*, **67**, 657–672
- Cahill, D.F. & Yuile, C.L. (1970) Tritium: Some effects of continuous exposure *in utero* on mammalian development. *Radiat. Res.*, **44**, 727–737
- Cahill, D.F., Wright, J.F., Godbold, J.H., Ward, J.M., Laskey, J.W. & Tompkins, E.A. (1975a) Neoplastic and life-span effects of chronic exposure to tritium. I. Effect on adult rat exposed during pregnancy. *J. natl Cancer Inst.*, **55**, 371–374
- Cahill, D.F., Wright, J.F., Godbold, J.H., Ward, J.M., Laskey, J.W. & Tompkins, E.A. (1975b) Neoplastic and life-span effects of chronic exposure to tritium. II. Rats exposed in utero. *J. natl Cancer Inst.*, **55**, 1165–1169
- Cahill, D.F., Reiter, L.W., Santolucito, J.A., Rehnberg, G.I., Ash, M.E., Favor, M.J., Bursian, S.J., Wright, J.F. & Laskey, J.W. (1976) Biological assessment of continuous exposure to tritium and lead in the rat. In: *Biological and Environmental Effects of Low-level Radiation*, Vol. II (IAEA-SM-202/305), Vienna, International Atomic Energy Agency, pp. 65–78
- Capen, C.C., Delellis, R.A. & Williams, E.D. (1999) Experimental thyroid carcinogenesis in rodents: Role of radiation and xenobiotic chemicals. In: Thomas, G., Karaoglu, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer*, Singapore, World Scientific, pp. 167–176
- Cardis, E. (1996) Epidemiology of accidental radiation exposures. *Environ. Health Perspectives*, **104** (Suppl. 3), 643–649
- Cardis, E., Anspaugh, L., Ivanov, V.K., Likhtarev, I.A., Mabuchi, K., Okeanov, A.E. & Prisyazhniuk, A.E. (1996) Estimated long term health effects of the Chernobyl accident. In: *One Decade after Chernobyl*, Vienna, International Atomic Energy Agency, pp. 241–279
- Cardis, E., Amoros, E., Kesminiene, A., Malakhova, I.V., Poliakov, S.M., Pilipsevitch, N.N., Demidchik, E.P., Astakhova, L.N., Ivanov, V.K., Konogorov, A.P., Parshkov, E.M. & Tsyb, A.F. (1999) Observed and predicted thyroid cancer incidence following the Chernobyl accident. Evidence for factors influencing susceptibility to radiation induced thyroid cancer. In: Thomas, G., Karaoglu, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer* (EUR 18552 EN), Singapore, World Scientific, pp. 395–405
- Carlsson, S. (1995) A glance at the history of nuclear medicine. *Acta oncol.*, **34**, 1095–1102
- Carnes, B.A., Groer, P.G. & Kotek, T.J. (1997) Radium dial workers: Issues concerning dose response and modeling. *Radiat. Res.*, **147**, 707–714
- Carpenter, L.M., Higgins, C.D., Douglas, A.J., Maconochie, N.E.S., Omar, R.Z., Fraser, P., Beral, V. & Smith, P.G. (1998) Cancer mortality in relation to monitoring for radionuclide exposure in three UK nuclear industry workforces. *Br. J. Cancer*, **78**, 1224–1232
- Carr, T.E.F. & Nolan, J. (1979) Testis mass loss in the mouse induced by tritiated thymidine, tritiated water, and  $^{60}\text{Co}$  gamma irradiation. *Health Phys.*, **36**, 135–145
- Carsten, A.L. & Commerford, S.L. (1976) Dominant lethal mutations in mice resulting from chronic tritiated water (HTO) ingestion. *Radiat. Res.*, **66**, 609–614
- Carsten, A.L., Commerford, S.L. & Cronkite, E.P. (1977) The genetic and late somatic effects of chronic tritium ingestion in mice. *Curr. Topics Radiat. Res. Q.*, **12**, 212–224
- Castle, J.N., Scott, K.G. & Reilly, W.A. (1964) The skeletal uptake of radiophosphorus ( $^{32}\text{P}$ ). *Am. J. Roentgenol.*, **91**, 1128–1131
- Castronovo, F.P. (1999) Teratogen update: Radiation and Chernobyl. *Teratology*, **60**, 100–106

- Cayolla da Motta, L., da Silva Horta, J. & Tavares, M.H. (1979) Prospective epidemiological study of Thorotrast-exposed patients in Portugal. *Environ. Res.*, **18**, 152–172
- Chamberlain, A.C. & Dunster, H.J. (1958) Deposition of radioactivity in north-west England from the accident at Windscale. *Nature*, **182**, 629–630
- Chambers, D.B., Stager, R.H. & Frost, S.E. (1999) How uncertainty could affect dose-response in the Beaverlodge Canada miners studies. In: Ron, E. & Hoffman, F.O., eds, *Uncertainties in Radiation Dosimetry and their Impact on Dose-Response Analyses* (NIH Publication No. 99-4541), Bethesda, MD, National Cancer Institute
- Chan, P.C., Lisco, E., Lisco, H. & Adelstein, S.J. (1976) The radiotoxicity of iodine-125 in mammalian cells. II. A comparative study on cell survival and cytogenetic responses to  $^{125}\text{IUDR}$ ,  $^{131}\text{IUDR}$ , and  $^3\text{HTdR}$ . *Radiat. Res.*, **67**, 332–343
- Chaundhry, M.A., Jiang, Q., Ricanati, M., Horng, M.F. & Evans, H.H. (1996) Characterization of multilocus lesions in human cells exposed to X radiation and radon. *Radiat. Res.*, **145**, 31–38
- Checkoway, H., Pearce, N., Crawford-Brown, D.J. & Cragle, D.L. (1988) Radiation doses and cause-specific mortality among workers at a nuclear materials fabrication plant. *Am. J. Epidemiol.*, **127**, 255–266
- Chen, D.J., Strniste, G.F. & Tokita, N. (1984) The genotoxicity of alpha particles in human embryonic skin fibroblasts. *Radiat. Res.*, **100**, 321–327
- Chen, X.-A., Huo, Q., Dong, Z., Li, W., Wang, Y., Cha, Y., Tan, G., He, W., Chen, M., Feng, R., Liang, L. & Li, R. (1986) Activity concentration of exhaled  $^{220}\text{Rn}$  and burden of  $^{228}\text{Th}$  in workers working at the Bai Yuan iron mine in Innermongolia and in inhabitants living in the high background radiation area in China. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, München, Urban & Schwarzenberg, pp. 157–162
- Chen, X.-A., Xiao, H.-J., Yang, Y.-J., Chen, L., Long, S.-C., Deng, Y.-M. & Fong, G.-D. (1989) A follow-up study (1980–87) on the relationship between thorium lung burden and health effects on miners at the Baiyan Obo mine, China. In: Taylor, D.M., Mays, C.M., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology, pp. 180–183
- Chen, X.-A., Xiao, H.-J., Cheng, Y.-E., Dong, Z.-H., Yang, Y.-J., Chen, L., Hao, J.-F. & He, Q.-C. (1993) A follow-up study (1982–1991) on the relationship between thorium lung burden and health effects in miners at the Baiyan Obo rare earth and iron mine. *Radiat. Prot. Aust.*, **11**, 157–161
- Chen, X.-A., Cheng, Y.-E., Rong, Z. & Yan, X.-S. (1999) Results of the follow-up study of the thorium lung burden and its health effects of thorium miners in China. *Radiat. Res.*, **152**, S163–S164
- Chen, X.-A., Cheng, Y.-E. & Rong, Z. (2000) Health effects following long-term exposure to thorium dusts. A fourteen-year follow-up study in China. In: *Proceedings of the 10th International Congress of IRPA*, Hiroshima, Japan Health Physics Society (CD-ROM)
- Chmelevsky, D., Mays, C.W., Spiess, H., Stefani, F.H. & Kellerer, A.M. (1988) An epidemiological assessment of lens opacifications that impaired vision in patients injected with radium-224. *Radiat. Res.*, **115**, 238–257
- Clarke, W.J. & Bair, W.J. (1964) Plutonium inhalation studies. VI. Pathologic effects of inhaled plutonium particles in dogs. *Health Phys.*, **10**, 391–398

- Cleaver, J.E. & Burki, H.J. (1974) Biological damage from intranuclear carbon-14 decays: DNA single-strand breaks and repair in mammalian cells. *Int. J. Radiat. Biol.*, **26**, 399–403
- Cleaver, J.E., Thomas, G.H. & Burki, H.J. (1972) Biological damage from intranuclear tritium: DNA strand breaks and their repair. *Science*, **177**, 996–998
- Coggle, J.E. (1983) *Biological Effects of Radiation*, London, Taylor Francis
- Cohen, B.L. (1995) Test of the linear-no threshold theory of radiation carcinogenesis for inhaled radon decay products. *Health Phys.*, **68**, 157–174
- Cohen, B.L. (1998) Response to criticisms of Smith et al. *Health Phys.*, **75**, 23–28, 31–33
- Cohen, B.L. (2000) Testing a BEIR-VI suggestion for explaining the lung cancer vs. radon relationship for US counties. *Health Phys.*, **78**, 522–527
- Cohen, B.S., Eisenbud, M. & Harley, N.H. (1980) Alpha radioactivity in cigarette smoke. *Radiat. Res.*, **83**, 190–196
- Cole, J., Green, M.H.L., Bridges, B.A., Waugh, A.P.W., Beare, D.M., Henshaw, D., Last, R., Liu, Y. & Cortopassi, G. (1996) Lack of evidence for an association between the frequency of mutants or translocations in circulating lymphocytes and exposure to radon gas in the home. *Radiat. Res.*, **145**, 61–69
- Committee on the Biological Effects of Ionizing Radiations (BEIR IV) (1988) *Health Risks of Radon and Other Internally Deposited Alpha-Emitters*, Washington DC, National Academy Press
- Committee on Health Risks of Exposure to Radon (BEIR VI) (1999) *Health Effects of Exposure to Radon*, Washington DC, National Academy Press
- Conard, R.A. (1984) Late radiation effects in Marshall Islanders exposed to fall-out 28 years ago. In: Boice, J.D., Jr & Fraumeni, J.F., Jr, eds, *Radiation Carcinogenesis: Epidemiology and Biological Significance*, New York, Raven Press, pp. 57–71
- Conard, R.A., Knudsen, K.D. & Dobyns, B.M. (1974) *A Twenty Year Review of Medical Findings in a Marshallese Population Accidentally Exposed to Radioactive Fallout* (BNL 50424), Upton, NY, Brookhaven National Laboratory
- Conard, R.A., Paglia, D.E., Larsen, R.P., Sutow, W.W., Dobyns, B.M., Robbins, J., Krotosky, W.A., Field, J.B., Rall, J.E. & Wolff, J. (1980) *Review of Medical Findings in a Marshallese Population Twenty-six Years after Accidental Exposure to Radioactive Fallout* (Brookhaven National Laboratory Report BNL 51261), Springfield, VA, National Technical Information Service
- Coquerelle, T.M., Weibe Zahnh, K.F. & Lücke-Huhle, C. (1987) Rejoining of double strand breaks in normal human and ataxia-telangiectasia fibroblasts after exposure to  $^{60}\text{Co}$  gamma-rays,  $^{241}\text{Am}$  alpha-particles or bleomycin. *Int. J. Radiat. Biol.*, **51**, 209–218
- Council on Pharmacy and Chemistry (1932) Thorotrast. *J. Am. med. Assoc.*, **99**, 2183–2185
- Cox, R., Thacker, J. & Goodhead, D.T. (1977) Inactivation and mutation of cultured mammalian cells by aluminium characteristic ultrasoft X-rays. II. Dose-responses of Chinese hamster and human diploid cells to aluminium X-rays and radiations of different LET. *Int. J. Radiat. Biol.*, **31**, 561–576
- Cox, D.R., Darby, S.C., Reeves, G.K. & Whitley, E. (1999) The effects of measurement errors with particular reference to a study of exposure to residential radon. In: Ron, E. & Hoffman, F.O., eds, *Uncertainties in Radiation Dosimetry and Their Impact on Dose-Response Analyses* (Publication No. 99-4541), Bethesda, MD, National Cancer Institute, pp. 139–151

- Crabtree, J. (1995) The travel and diffusion of the radioactive material emitted during the Windscale accident. *Q. J. roy. Meteo. Soc.*, **85**, 362–370
- Cronkite, E.P., Bond, V.P. & Conard, R.A. (1995) Medical effects of exposure of human beings to fallout radiation from a thermonuclear explosion. *Stem Cells*, **13** (Suppl. 1), 49–57
- Cross, F.T., Endres, G.W.R. & Sullivan, M.F. (1978) Dose to the GI tract from ingested insoluble beta emitters. *Radiat. Res.*, **73**, 37–50
- Daghigian, F., Humm, J.L., Macapinlac, H.A., Zhang, J., Izzo, J., Finn, R., Kemeny, N. & Larson, S.M. (1995) Pharmacokinetics and dosimetry of iodine-125-IUDR in the treatment of colorectal cancer metastatic to liver. *J. nucl. Med.*, **37**, 29S–32S
- Dagle, G.E., Weller, R.E., Filipy, R.E., Watson, C.R. & Buschbom, R.L. (1996) The distribution and effects of inhaled  $^{239}\text{Pu}(\text{NO}_3)_4$  deposited in the liver of dogs. *Health Phys.*, **71**, 198–205
- Daher, A., Varin, M., Lamontagne, Y. & Oth, D. (1998) Effect of pre-conceptional external or internal irradiation of N5 male mice and the risk of leukemia in their offspring. *Carcinogenesis*, **19**, 1553–1558
- Dalheimer, A.R. & Kaul, A. (1989) Calculation of the basal cell dose in Thorotrast patients. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology, pp. 112–115
- Dalheimer, A.R., Spiethoff, A. & Kaul, A. (1995) Calculation of dose to non-storing organs of Thorotrast patients. In: van Kaick, G., Karaoglou, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 39–42
- Darby, S.C. & Doll, R. (1990) Radiation and exposure rate (Letter to the Editor). *Nature*, **344**, 824
- Darby, S.C., Radford, E.P. & Whitley, E. (1995a) Radon exposure and cancers other than lung cancer in Swedish iron miners. *Environ. Health Perspectives*, **103** (Suppl. 2), 45–47
- Darby, S.C., Whitley, E., Howe, G.R., Hutchings, S.J., Kusiak, R.A., Lubin, J.A., Morrison, H.I., Tirmarche, M., Tomášek, L., Radford, E.P., Roscoe, R.J., Samet, J.M. & Yao, S.X. (1995b) Radon and cancers other than lung cancer in underground miners: A collaborative analysis of 11 studies. *J. natl Cancer Inst.*, **87**, 378–384
- Darby, S.C., Whitley, E., Silcocks, P., Thakrar, B., Green, M., Lomas, P., Miles, J., Reeves, G., Fearn, T. & Doll, R. (1998) Risk of lung cancer associated with residential radon exposure in south-west England: A case-control study. *Br. J. Cancer*, **78**, 394–408
- Darby, S.C., Whitley, E., Deo, H. & Doll, R. (2001) A parallel analysis of individual and ecological data on residential radon and lung cancer in south-west England. *J. R. stat. Soc.*, Series A, **164**, 193–203
- Degteva, M.O., Kozheurov V.P. & Vorobiova, M.I. (1994) General approach to dose reconstruction in the population exposed as a result of the release of radioactive wastes into the Techa River. *Sci. total Environ.*, **142**, 49–61
- Degteva, M.O., Kozheurov, V.P., Burmistrov, D.S., Vorobyova, M.I., Valchuk, V.V., Bougrov, N.G. & Shishkina, H.A. (1996) An approach to dose reconstruction for the Urals population. *Health Phys.*, **71**, 71–76
- Degteva, M.O., Vorobiova, M.I., Kozheurov, V.P., Tolstykh, E.I., Anspaugh, L.R. & Napier, B.A. (2000a) Dose reconstruction system for the exposed population living along the Techa River. *Health Phys.*, **78**, 542–554

- Degteva, M.O., Kozheurov, V.P., Tolstykh, E.I., Vorobiova, M.I., Anspaugh, L.R., Napier, B.A. & Kovtun, A.N. (2000b) The Techa River dosimetry system: Methods for the reconstruction of internal dose. *Health Phys.*, **79**, 24–35
- Demidchik, E.P., Mrochek, A., Demidchik, Y., Vorontsova, T., Cherstvoy, E., Kenigsberg, J., Rebeko V. & Sugenoya, A. (1999) Thyroid cancer promoted by radiation in young people of Belarus (clinical and epidemiological features). In: Thomas, G., Karaoglu, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer* (EUR 18552 EN), Singapore, World Scientific, pp. 51–54
- De Rooij, D.G. & Rönnbäck, C. (1989) The effect of <sup>90</sup>Sr given to pregnant mice on spermatogenesis in the male offspring: A comparison with the effect on the ovaries in the female offspring. *Int. J. Radiat. Biol.*, **56**, 151–159
- Desai, P., Perino, G., Present, D. & Steiner, G.C. (1996) Sarcoma in association with bone infarcts. Report of five cases. *Arch. Pathol. Lab. Med.*, **120**, 482–489
- Deshpande, A., Goodwin, E.H., Bailey, S.M., Marrone, B.L. & Lehnert, B.E. (1996) Alpha-particle-induced sister chromatid exchange in normal human lung fibroblasts: Evidence for an extranuclear target. *Radiat. Res.*, **145**, 260–267
- Dev, P.K. & Srivastava, P.N. (1981) Effects of radiophosphorus on the developing endocrine glands of Swiss albino mice. *Strahlentherapie*, **157**, 418–426
- Diel, J.H., Guilmette, R.A., Muggenburg, B.A., Hahn, F.F. & Chang, I.-Y. (1992) Influence of dose rate on survival time for <sup>239</sup>PuO<sub>2</sub>-induced radiation pneumonitis or pulmonary fibrosis in dogs. *Radiat. Res.*, **129**, 53–60
- Doll, R. (1998) Effects of small doses of ionising radiation. *J. radiol. Prot.*, **18**, 163–174
- Dougherty, T.F. & Mays, C.W. (1969) Bone cancer induced by internally-deposited emitters in beagles. In: *Radiation-induced Cancer*, Vienna, International Atomic Energy Agency, pp. 361–367
- Dougherty, T.F., Stover, B.J., Dougherty, J.H., Jee, W.S.S., Mays, C.W., Rehfeld, C.E., Christensen, W.R. & Goldthorpe, H.C. (1962) Studies of the biological effects of Ra<sup>226</sup>, Pu<sup>239</sup>, Ra<sup>228</sup>(MsTh<sub>1</sub>), Th<sup>228</sup>(RdTh), and Sr<sup>90</sup> in adult beagles. *Radiat. Res.*, **17**, 625–681
- Douglas, A.J., Omar, R.Z. & Smith, P.G. (1994) Cancer mortality and morbidity among workers at the Sellafield plant of British Nuclear Fuels. *Br. J. Cancer*, **70**, 1232–1243
- Doyle, D.V., Glass, J.S., Gow, P.J., Daker, M. & Grahame, R. (1977) A clinical and prospective chromosomal study of yttrium-90 synovectomy. *Rheumatol. Rehabil.*, **16**, 217–222
- Druckrey, H. (1973) Chemical structure and action in transplacental carcinogenesis and teratogenesis. In: Tomatis, L. & Mohr, U., eds, *Transplacental Carcinogenesis* (IARC Scientific Publications No. 4), Lyon, IARCPress, pp. 45–55
- Dubasov, U.V., Matushenko, A.M. & Pilonov, N.P. (1994) *Semi Palatinsk Test Site: Estimated Radiological Consequences (Information Bulletin)*, Moscow, Centre for Public Information on Atomic Energy
- Dudoignon, N., Guézingar-Liébard, F., Guillet, K., L'Huillier, I., Rateau, G., Monchaux, G. & Fritsch, P. (1999) Lung carcinogenesis in rats after inhalation exposure to <sup>237</sup>NpO<sub>2</sub>. *Radiat. Res.*, **152**, S31–S33
- Dunning, D.E., Jr & Schwartz, G. (1981) Variability of human thyroid characteristics and estimates of dose from ingested <sup>131</sup>I. *Health Phys.*, **40**, 661–675

- Dupree, E.A., Cragle, D.L., McLain, R.W., Crawford-Brown, D.J. & Teta, M.J. (1987) Mortality among workers at a uranium processing facility, the Linde Air Products Company Ceramics Plant, 1943–1949. *Scand. J. Work Environ. Health*, **13**, 100–107
- Dupree, E.A., Watkins, J.P., Ingle, J.N., Wallace, P.W., West, C.M. & Tankersley, W.G. (1995) Uranium dust exposure and lung cancer risk in four uranium processing operations. *Epidemiology*, **6**, 370–375
- Durbin, P.W. (1972) Plutonium in man: A new look at the old data. In: Stover, B.J. & Jee, W.S.S., eds, *Radiobiology of Plutonium*, Salt Lake City, J.W. Press, pp. 469–530
- Durbin, P.W., White, D.L., Jeung, N.L., Weitl, F.L., Uhli, L.C., Jones, E.S., Bruenger, F.W. & Raymond, K.N. (1989) Chelation of  $^{238}\text{Pu}(\text{IV})$  in vivo by 3,3,4-LICAM(C): Effects of ligand methylation and pH. *Health Phys.*, **56**, 839–855
- Eatough, J.P. & Henshaw, D.L. (1992) Radon and thoron associated dose to the basal layer of the skin. *Phys. Med. Biol.*, **37**, 955–967
- Eatough, J.P. & Henshaw, D.L. (1995) The theoretical risk of non-melanoma skin cancer from environmental radon exposure. *J. Radiol. Prot.*, **15**, 45–51
- Edmonds, C.J. & Smith, T. (1986) The long-term hazards of the treatment of thyroid cancer with radioiodine. *Br. J. Radiol.*, **59**, 45–51
- Efurd, D.W., Perrin, R.E. & McInroy, J.F. (1986) Neptunium-237 in human tissue samples. *Health Phys.*, **51**, 665–666
- Elkind, M.M. (1980) Cells, targets and molecules in radiation biology. In: Meyn, R.E. & Withers, H.R., eds, *Radiation Biology in Cancer Research*, New York, Raven Press, pp. 71–93
- Ellender, M., Harrison, J.D., Pottinger, H. & Thomas, J.M. (2001) Induction of osteosarcoma and acute myeloid leukaemia in CBA/H mice by the alpha-emitting nuclides, uranium-233, plutonium-239 and americium-241. *Int. J. Radiat. Biol.*, **77**, 41–52
- Etnier, E.L., Travis, C.C. & Hetrick, D.M. (1984) Metabolism of organically bound tritium in man. *Radiat. Res.*, **100**, 487–502
- EURATOM (1996) Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. *Off. J. Eur. Comm.*, **39**, L159/1114
- Evans, R.D. (1966) The effect of skeletally deposited alpha-ray emitters in man. *Br. J. Radiol.*, **39**, 881–895
- Evans, R.D., Keane, A.T., Kolenkow, R.J., Neal, W.R. & Shanahan, M.M. (1969) Radiogenic tumors in the radium and mesothorium. Cases studied at MIT. In: Mays, C.W., Jee, W.S.S. & Lloyd, R., eds, *Delayed Effects of Bone-seeking Radionuclides*, Salt Lake City, University of Utah Press
- Evans, H.H., Mencl, J., Bakale, G., Rao, P.S., Jostes, R.F., Hui, T.E., Cross, F.T. & Schwartz, J.L. (1993) Interlaboratory comparison of the effects of radon on L5178Y cells: Dose contribution of radon daughter association with cells. *Radiat. Res.*, **136**, 48–56
- Fauvert, R., Boivin, P., Mallarmé, J. & Nicollo, F. (1961) [Conduct and results of polycythemia vera treatment by phosphorus-32. Study of 200 cases] *Nouv. Rev. Fr. Hématol.*, **1**, 459–468 (in French)
- Feinendegen, L.E., Henneberg, P. & Tisljar-Lentulis, G. (1977) DNA strand breakage and repair in human kidney cells after exposure to incorporated iodine-125 and cobalt-60  $\gamma$ -rays. *Curr. Topics Radiat. Res. Q.*, **12**, 436–452

- Feith, R., Slooff, T.J., Kazem, I. & van Rens, T.J. (1976) Strontium 87mSr bone scanning for the evaluation of total hip replacement. *J. Bone Joint Surg. Br.*, **58**, 79–83
- Fell, T.P., Harrison, J.D. & Leggett, R.W. (1998) A model for the transfer of calcium and strontium to the fetus. *Radiat. Prot. Dosim.*, **79**, 311–315
- Ferrand, S.K., Chen, C.C., Dilsizian, V. & Neumann, R.D. (1999) What is new in nuclear medicine imaging? *Surg. Oncol. Clin. N. Am.*, **8**, 185–204
- Field, S.B. & Upton, A.C. (1985) Non-stochastic effects: Compatibility with present ICRP recommendations. *Int. J. Radiat. Biol.*, **48**, 81–94
- Field, R.W., Steck, D.J., Smith, B.J., Brus, C.P., Fisher, E.L., Neuberger, J.S., Platz, C.E., Robinson, R.A., Woolson, R.F. & Lynch, C.F. (2000) Residential radon gas exposure and lung cancer. The Iowa Radon Lung Cancer Study. *Am. J. Epidemiol.*, **151**, 1091–1102
- Finch, G.L., March, T.H., Hahn, F.F., Barr, E.B., Belinsky, S.A., Hoover, M.D., Lechner, J.F., Nikula, K.J. & Hobbs, C.H. (1998) Carcinogenic responses of transgenic heterozygous *p53* knockout mice to inhaled  $^{239}\text{PuO}_2$  or metallic beryllium. *Toxicol. Pathol.*, **26**, 484–491
- Fleischer, R.L. & Raabe, O.G. (1977) Fragmentation of respirable  $\text{PuO}_2$  particles in water by alpha decay — A mode of ‘dissolution’. *Health Phys.*, **32**, 253–257
- Fogelman, I., Smith, L., Mazess, R., Wilson, M.A. & Bevan, J.A. (1986) Absorption of oral diphosphate in normal subjects. *Clin. Endocrinol.*, **24**, 57–62
- Fong, K.M., Zimmerman, P.V. & Smith, P.J. (1995) Lung pathology: The molecular genetics of non-small cell lung cancer. *Pathology*, **27**, 295–301
- Forastiere, F., Sperati, A., Cherubini, G., Miceli, M., Biggeri, A. & Axelson, O. (1998) Adult myeloid leukaemia, geology, and domestic exposure to radon and  $\gamma$  radiation: A case control study in central Italy. *Occup. Environ. Med.*, **55**, 106–110
- Ford, J.R. & Terzaghi-Howe, M. (1993) Effects of  $^{210}\text{Po}$  alpha particles on survival and preneoplastic transformation of primary rat tracheal epithelial cells irradiated while in suspension or in the intact tissue. *Radiat. Res.*, **136**, 89–96
- Foulon, C.F., Alston, K.L. & Zalutsky, M.R. (1998) Astatine-211-labeled biotin conjugates resistant to biotinidase for use in pretargeted radioimmunotherapy. *Nucl. Med. Biol.*, **25**, 81–88
- Fox, J.C. & McNally, N.J. (1990) The rejoicing of DNA double-strand breaks following irradiation with  $^{238}\text{Pu}$  alpha-particles: Evidence for a fast component of repair as measured by neutral filter elution. *Int. J. Radiat. Biol.*, **57**, 513–521
- Francis, C.W., Chesters, G. & Erhardt, W.H. (1968)  $^{210}\text{Polonium}$  entry into plants. *Environ. Sci. Technol.*, **2**, 690–695
- Frankenberg, D., Kühn, H., Frankenberg-Schwager, M., Lenhard, W. & Beckonert, S. (1995) 0.3 keV carbon K ultrasoft X-rays are four times more effective than  $\gamma$ -rays when inducing oncogenic cell transformation at low doses. *Int. J. Radiat. Biol.*, **68**, 593–601
- Franklyn, J.A., Maisonneuve, P., Sheppard, M., Betteridge, J. & Boyle, P. (1999) Cancer incidence and mortality after radioiodine treatment for hyperthyroidism: A population-based cohort study. *Lancet*, **353**, 2111–2115
- Freitas, J.E., Swanson, D.P., Gross, M.D. & Sisson, J.C. (1979) Iodine-131: Optimal therapy for hyperthyroidism in children and adolescents? *J. nucl. Med.*, **20**, 847–850
- Frome, E.L., Cragle, D.L., Watkins, J.P., Wing, S., Shy, C.M., Tankersley, W.G. & West, C.M. (1997) A mortality study of employees of the nuclear industry in Oak Ridge, Tennessee. *Radiat. Res.*, **148**, 64–80, 297–298 (errata)

- Fry, S.A. (1998) Studies of US radium dial workers: An epidemiological classic. *Radiat. Res.*, **150** (Suppl), S21–S29
- Fry, S.A. & Sipe, A.H. (1986) The REAC/TS registries status. In: Kaul, A., Dehos, A., Bögl, W., Hinz, G., Kossel, F., Schwarz, E.-R., Stamm, A. & Stephan G., eds, *Biological Indicators for Radiation Dose Assessment*, Munich, MMV Medizin Verlag, pp. 35–56
- Fugazzola, L., Pilotti, S., Pinchera, A., Vorontsova, T.V., Mondellini, P., Bongarzone, I., Greco, A., Astakhova, L., Butti, M.G., Demidchik, E.P., Pacini, F. & Pierotti, M.A. (1995) Oncogenic rearrangements of the *RET* proto-oncogene in papillary thyroid carcinomas from children exposed to the Chernobyl nuclear accident. *Cancer Res.*, **55**, 5617–5620
- Furuno-Fukushi, I., Ueno, A.M. & Matsudaira, H. (1987) Cell killing and mutation to 6-thioguanine resistance after exposure to tritiated amino acids and tritiated thymidine in cultured mammalian cells (L5178Y). *Radiat. Res.*, **110**, 428–438
- Gafieva, Z.A. & Chudin, V.A. (1988) [Biological action of plutonium-239 on *Salmonella typhimurium*.] *Radiobiologiia*, **28**, 563–565 (in Russian)
- Galvin, J.B., Bice, D.E., Guilmette, R.A., Muggenburg, B.A. & Haley, P.J. (1989) Pulmonary immune response of dogs after exposure to  $^{239}\text{PuO}_2$ . *Int. J. Radiat. Biol.*, **55**, 285–296
- Garg, P.K., Harrison, C.L. & Zalutsky, M.R. (1990) Comparative tissue distribution in mice of the  $\alpha$ -emitter  $^{211}\text{At}$  and  $^{131}\text{I}$  as labels of a monoclonal antibody and  $\text{F}(\text{ab}')_2$  fragment. *Cancer Res.*, **50**, 3514–3520
- Garg, P.K., John, C.S. & Zalutsky, M.R. (1995) Preparation and preliminary evaluation of 4-[ $^{211}\text{At}$ ]astato-N-piperidinoethyl benzamide. *Nucl. Med. Biol.*, **22**, 467–473
- Gaull, G.E., Räihä, N.C.R., Saarikoski, S. & Sturman, J.A. (1973) Transfer of cyst(e)ine and methionine across the human placenta. *Pediat. Res.*, **7**, 908–913
- George, A.C. & Breslin, A.J. (1967) Deposition of natural radon daughters in human subjects. *Health Phys.*, **13**, 375–378
- Gerasimo, P., Duserre, C. & Métivier, H. (1986) Biological behaviour of Pu administered to animals as Pu-standard LICAM(C) complex: Therapeutic attempts to decrease Pu kidney burden. *Hum. Toxicol.*, **5**, 309–318
- Gerber, G.B., Wick, R.R., Watson, C.R., Gössner, W. & Kellerer, A.M. (1999) International radiobiology archives of long-term animal studies: Structure, possible uses and potential extension. *Radiat. environ. Biophys.*, **38**, 75–79
- Gilbert, E.S. (1994) Smoking as an explanation for the negative relationship between exposure to radon and certain types of cancer. *Health Phys.*, **67**, 197–198
- Gilbert, E.S., Park, J.F. & Buschbom, R.L. (1989) Time-related factors in the study of risks in animals and humans. *Health Phys.*, **57**, 379–385
- Gilbert, E.S., Tarone, R., Bouville, A. & Ron, E. (1998a) Thyroid cancer rates and  $^{131}\text{I}$  doses from Nevada atmospheric nuclear bomb tests. *J. natl Cancer Inst.*, **90**, 1654–1660
- Gilbert, E.S., Griffith, W.C., Boecker, B.B., Dagle, G.E., Guilmette, R.A., Hahn, F.F., Muggenburg, B.A., Park, J.F. & Watson, C.R. (1998b) Statistical modeling of carcinogenic risks in dogs that inhaled  $^{238}\text{PuO}_2$ . *Radiat. Res.*, **150**, 66–82
- Gilbert, E.S., Koshurnikova, N.A., Sokolnikov, M.E., Khokhryakov, V.F., Miller, S., Preston, D.L., Romanov, S.A., Shilnikova, N.S., Suslova, K.G. & Vostrotin, V.V. (2000) Liver cancers in Mayak workers. *Radiat. Res.*, **154**, 246–252

- Gillett, N.A., Hahn, F.F., Mewhinney, J.A. & Muggenberg, B.A. (1985) Osteosarcoma development following single injection exposure to americium-241 in beagle dogs. *Radiat. Res.*, **104**, 83–93
- Gillett, N.A., Muggenburg, B.A., Boecker, B.B., Griffith, W.C., Hahn, F.F. & McClellan, R.O. (1987a) Single inhalation exposure to  $^{90}\text{SrCl}_2$  in the beagle dog: Late biological effects. *J. natl Cancer Inst.*, **79**, 359–376
- Gillett, N.A., Muggenburg, B.A., Boecker, B.B., Hahn, F.F., Seiler, F.A., Rebar, A.H., Jones, R.K. & McClellan, R.O. (1987b) Single inhalation exposure to  $^{90}\text{SrCl}_2$  in the beagle dog: Hematological effects. *Radiat. Res.*, **110**, 267–288
- Gillett, N.A., Muggenburg, B.A., Mewhinney, J.A., Hahn, F.F., Seiler, F.A., Boecker, B.B. & McClellan, R.O. (1988) Primary liver tumours in beagle dogs exposed by inhalation to aerosols of plutonium-238 dioxide. *Am. J. Pathol.*, **133**, 265–276
- Gillett, N.A., Pool, R.R., Taylor, G.N., Muggenburg, B.A. & Boecker, B.B. (1992) Strontium-90 induced bone tumours in beagle dogs: Effects of route of exposure and dose rate. *Int. J. Radiat. Biol.*, **61**, 821–831
- Goldman, M.B., Maloof, F., Monson, R.R., Aschengrau, A., Cooper, D.S. & Ridgway, E.C. (1988) Radioactive iodine therapy and breast cancer. A follow-up study of hyperthyroid women. *Am. J. Epidemiol.*, **127**, 969–980
- Goodhead, D.T. (1994) Initial events in the cellular effects of ionizing radiations: Clustered damage in DNA. *Int. J. Radiat. Biol.*, **65**, 7–17
- Goodhead, D.T. & Thacker, J. (1977) Inactivation and mutation of cultured mammalian cells by aluminium characteristic ultrasoft X-rays. I. Properties of aluminium X-rays and preliminary experiments with Chinese hamster cells. *Int. J. Radiat. Biol.*, **31**, 541–559
- Goodhead, D.T., Thacker, J. & Cox, R. (1979) Effectiveness of 0.3 keV carbon ultrasoft X-rays for the inactivation and mutation of cultured mammalian cells. *Int. J. Radiat. Biol.*, **36**, 101–114
- Goolden, A.W. & Davey, J.B. (1963) The ablation of normal thyroid tissue with iodine 131. *Br. J. Radiol.*, **36**, 340–345
- Gössner, W. (1986) Pathology of radiation-induced bone tumors. *Leukemia Res.*, **10**, 897–904
- Gössner, W. (1999) Pathology of radium-induced bone tumors: New aspects of histopathology and histogenesis. *Radiat. Res.*, **152**, S12–S15
- Gössner, W., Hug, O., Luz, A. & Müller, W.A. (1976) Experimental induction of bone tumours by short-lived bone-seeking radionuclides. *Recent Results Cancer Res.*, **54**, 36–49
- Gössner, W., Wick, R.R. & Spiess, H. (1995) Histopathological review of radium-224 induced bone sarcomas. In: van Kaick, G., Karaoglu, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 255–259
- Gössner, W., Masse, R. & Stather, J.W. (2000) Cells at risk for dosimetric modelling relevant to bone tumour induction. *Radiat. Prot. Dosim.*, **92**, 209–213
- Goulko, G.M., Chepurny, N.I., Jacob, P., Kairo, I.A., Likhtarev, I.A., Pröhl, G. & Sobolev, B.G. (1998) Thyroid dose and thyroid cancer incidence after the Chernobyl accident: Assessments for the Zhytomyr region (Ukraine). *Radiat. environ. Biophys.*, **36**, 261–273
- Gragtmans, N.J., Myers, D.K., Johnson, J.R., Jones, A.R. & Johnson, L.D. (1984) Occurrence of mammary tumors in rats after exposure to tritium beta rays and 200-kVp X rays. *Radiat. Res.*, **99**, 636–650

- Graham, S.J., Heaton, R.B., Garvin, D.F. & Cotelingam, J.D. (1992) Whole-body pathologic analysis of a patient with Thorotrast-induced myelodysplasia. *Health Phys.*, **63**, 20–26
- Gray, S.A., Pearce, M.J., Stradling, G.N., Wilson, I., Hodgson, A. & Isaacs, K.R. (1995) Optimizing the removal of inhaled plutonium and americium from the rat by administration of ZnDTPA in drinking water. *Hum. exp. Toxicol.*, **14**, 902–908
- Greaves, C.D. & Tindale, W.B. (1999) Dose rate measurements from radiopharmaceuticals: Implications for nuclear medicine staff and for children with radioactive parents. *Nucl. Med. Commun.*, **20**, 179–187
- Greenland, S. & Robins, J. (1994) Invited commentary: Ecologic studies — Biases, misconceptions, and counterexamples. *Am. J. Epidemiol.*, **139**, 747–760
- Griffey, S.M., Kraegel, S.A., Weller, R.E., Watson, C.R. & Madewell, B.R. (1998) K-ras mutation in  $^{239}\text{PuO}_2$  canine lung neoplasms. *Cancer Lett.*, **132**, 1–5
- Griffin, C.S., Harvey, A.N. & Savage, J.R.K. (1994) Chromatid damage induced by  $^{238}\text{Pu}$   $\alpha$ -particles in G<sub>2</sub> and S phase Chinese hamster V79 cells. *Int. J. Radiat. Biol.*, **66**, 85–98
- Griffin, C.S., Marsden, S.J., Stevens, D.L., Simpson, P. & Savage, J.R.K. (1995) Frequencies of complex chromosome exchange aberrations induced by  $^{238}\text{Pu}$  alpha-particles and detected by fluorescence *in situ* hybridization using single chromosome-specific probes. *Int. J. Radiat. Biol.*, **67**, 431–439
- Griffin, C.S., Hill, M.A., Papworth, D.G., Townsend, K.M.S., Savage, J.R.K. & Goodhead, D.T. (1998) Effectiveness of 0.28 keV carbon K ultrasoft X-rays at producing simple and complex chromosome exchanges in human fibroblasts *in vitro* detected using FISH. *Int. J. Radiat. Biol.*, **73**, 591–598
- Griffith, W.C., Mewhinney, J.A., Muggenburg, B.A., Boecker, B.B., Cuddihy, R.G. (1983) Bioassay model for estimating body burdens of  $^{241}\text{Am}$  from excretion analyses. *Health Phys.*, **44**, 545–554
- Griffith, T.P., Pirie, A. & Vaughan, J. (1985) Possible cataractogenic effect of radionuclides deposited within the eye from the blood stream. *Br. J. Ophthalmol.*, **69**, 219–227
- Griffiths, S.D., Marsden, S.J., Wright, E.G., Greaves, M.F. & Goodhead, D.T. (1994) Lethality and mutagenesis of B lymphocytes progenitor cells following exposure to  $\alpha$ -particles and X-rays. *Int. J. Radiat. Biol.*, **66**, 197–205
- Grillmaier, R. & Muth, H. (1971) Radiation dose distribution in lungs of Thorotrast patients. *Health Phys.*, **20**, 409–419
- Guilmette, R.A. & Muggenburg, B.A. (1993) Decoration therapy for inhaled plutonium nitrate using repeatedly and continuously administered DTPA. *Int. J. Radiat. Biol.*, **63**, 395–403
- Guilmette, R.A., Cohen, N. & Wrenn, M.E. (1980) Distribution and retention of  $^{241}\text{Am}$  in the baboon. *Radiat. Res.*, **81**, 100–119
- Guilmette, R.A., Gillett, N.A., Eidson, A.F., Griffith, W.C. & Brooks, A.L. (1989) The influence of non-uniform  $\alpha$ -irradiation of Chinese hamster liver on chromosome damage and the induction of cancer. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BRI Report 21), London, British Institute of Radiology, pp. 142–148
- Gundy, S., Katz, N., Füzy, M. & Ésik, O. (1996) Cytogenetic study of radiation burden in thyroid disease patients treated with external irradiation or radioiodine. *Mutat. Res.*, **360**, 107–113

- Gutiérrez, B.S., Carbonell, E., Galofréa, P., Creus, A. & Marcos, R. (1999a) Cytogenetic damage after 131-iodine treatment for hyperthyroidism and thyroid cancer — A study using the micronucleus test. *Eur. J. nucl. Med.*, **26**, 1589–1596
- Gutiérrez, S., Carbonell, E., Galofréa, P., Creus, A. & Marcos, R. (1999b) Low sensitivity of the sister chromatid exchange assay to detect the genotoxic effects of radioiodine therapy. *Mutagenesis*, **14**, 221–226
- Gutiérrez, S., Carbonell, E., Galofréa, P., Xamena, N., Creus, A. & Marcos, R. (1995) A cytogenetic follow-up study of thyroid cancer patients treated with  $^{131}\text{I}$ . *Cancer Lett.*, **91**, 199–204
- Hagerman, D.D. & Vilée, C.A. (1960) Transport functions of the placenta. *Physiol. Rev.*, **40**, 313–330
- Hahn, F.F. & Lundgren, D.L. (1992) Pulmonary neoplasms in rats that inhaled cerium-144 dioxide. *Toxicol. Pathol.*, **20**, 169–178
- Hahn, F.F., Lundgren, D.L. & McClellan, R.O. (1980) Repeated inhalation exposure of mice to  $^{144}\text{CeO}_2$ . II. Biologic effects. *Radiat. Res.*, **82**, 123–137
- Hahn, F.F., Muggenburg, B.A. & Boecker, B.B. (1995) Hepatic lesions induced by chronic beta irradiation from  $^{144}\text{Ce}$  in dogs. In: van Kaick, G., Karaoglu, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium*, Singapore, World Scientific, pp. 337–340
- Hahn, F.F., Boecker, B.B., Griffith, W.C. & Muggenburg, B.A. (1997) Biological effects of inhaled  $^{144}\text{CeCl}_3$  in beagle dogs. *Radiat. Res.*, **147**, 92–108
- Hahn, F.F., Muggenburg, B.A., Guilmette, R.A. & Boecker, B.B. (1999) Comparative stochastic effects of inhaled alpha- and beta-particle-emitting radionuclides in beagle dogs. *Radiat. Res.*, **152**, S19–S22
- Haines, J.W., Naylor, G.P.L., Pottinger, H. & Harrison, J.D. (1993) Gastrointestinal absorption and retention of polonium in adult and newborn rats and guinea pigs. *Int. J. Radiat. Biol.*, **64**, 127–132
- Haines, J.W., Harrison, J.D., Pottinger, H.E. & Phipps, A.W. (1995) Transfer of polonium to the embryo and foetus of rat and guinea pig. *Int. J. Radiat. Biol.*, **67**, 381–390
- Hall, E.J. (1978) *Radiobiology for Radiologists*, 2nd Ed., New York, Harper & Rowe
- Hall, P., Holm, L.-E., Lundell, G., Bjelkengren, G., Larsson, L.-G., Lindberg, S., Tennvall, J., Wiklund, H. & Boice, J.D., Jr (1991) Cancer risks in thyroid cancer patients. *Br. J. Cancer*, **64**, 159–163
- Hall, P., Berg, G., Bjelkengren, G., Boice, J.D., Jr, Ericsson, U.-B., Hallquist, A., Lidberg, M., Lundell, G., Tennvall, J., Wiklund, K. & Holm, L.-E. (1992a) Cancer mortality after iodine-131 therapy for hyperthyroidism. *Int. J. Cancer*, **50**, 886–890
- Hall, P., Boice, J.D., Jr, Berg, G., Bjelkengren, G., Ericsson, U.-B., Hallquist, A., Lidberg, M., Lundell, G., Mattsson, A., Tennvall, J., Wiklund, K. & Holm, L.-E. (1992b) Leukaemia incidence after iodine-131 exposure. *Lancet*, **340**, 1–4
- Hall, P., Lundell, G. & Holm, L.-E. (1993) Mortality in patients treated for hyperthyroidism with iodine-131. *Acta endocrinol.*, **128**, 230–234
- Hall, P., Fürst, C.J., Mattsson, A., Holm, L.-E., Boice, J.D., Jr & Inskip, P.D. (1996a) Thyroid nodularity after diagnostic administration of iodine-131. *Radiat. Res.*, **146**, 673–682
- Hall, P., Mattsson, A. & Boice, J.D., Jr (1996b) Thyroid cancer after diagnostic administration of iodine-131. *Radiat. Res.*, **145**, 86–92

- Halnan, K.E. & Russell, M.H. (1965) Polycythaemia vera. Comparison of survival and causes of death in patients managed with and without radiotherapy. *Lancet*, **ii**, 760–763
- Ham, G.J. & Harrison, J.D. (2000) The gastrointestinal absorption and urinary excretion of plutonium in male volunteers. *Radiat. Prot. Dosim.*, **87**, 267–272
- Harduin, J.C., Royer, P. & Piechowski, J. (1994) Uptake and urinary excretion of uranium after oral administration in man. *Radiat. Prot. Dosim.*, **53**, 245–248
- Harley, N.H. & Robbins, E.S. (1992)  $^{222}\text{Rn}$  alpha dose to organs other than lung. *Radiat. Prot. Dosim.*, **45**, 619–622
- Harman, J.B. & Ledlie, E.M. (1967) Survival of polycythaemia vera patients treated with radioactive phosphorus. *Br. med. J.*, **ii**, 146–148
- Harper, K., Lorimore, S.A. & Wright, E.G. (1997) Delayed appearance of radiation-induced mutations at the *Hprt* locus in murine hemopoietic cells. *Exp. Hematol.*, **25**, 263–269
- Harrington, H.L. & Huggins, C. (1939) Rate of removal of thorium dioxide from blood stream. *Arch. intern. Med.*, **63**, 445–452
- Harrison, J.D. (1991) The gastrointestinal absorption of the actinide elements. *Sci. total Environ.*, **100**, 43–60
- Harrison, J.D. & Fritsch, P. (1992) The effect of age on the absorption and intestinal retention of ingested radionuclides. *Radiat. Prot. Dosim.*, **41**, 71–76
- Hassfjell, S.P., Bruland, Ø.S. & Hoff, P. (1997)  $^{212}\text{Bi}$ -DOTMP: An alpha particle emitting bone-seeking agent for targeted radiotherapy. *Nucl. Med. Biol.*, **24**, 231–237
- Hayek, A., Chapman, E.M. & Crawford, J.D. (1970) Long-term results of treatment of thyrotoxicosis in children and adolescents with radioactive iodine. *New Engl. J. Med.*, **283**, 949–953
- Hei, T.K., Piao, C.Q., Willey, J.C., Thomas, S. & Hall, E.J. (1994) Malignant transformation of human bronchial epithelial cells by radon-simulated  $\alpha$ -particles. *Carcinogenesis*, **15**, 431–437
- Hei, T.K., Wu, L.-J., Liu, S.-X., Vannais, D., Waldren, C.A. & Randers-Pehrson, G. (1997) Mutagenic effects of a single and an exact number of  $\alpha$  particles in mammalian cells. *Proc. natl Acad. Sci. USA*, **94**, 3765–3770
- Heid, K.R. (1983) A comparison of systemic burdens at autopsy to estimates based on health physics data for selected plutonium workers. *Health Phys.*, **44** (Suppl. 1), 477–483
- Heidenreich, W.F., Kenigsberg, J., Jacob, P., Buglova, E., Goulko, G., Paretzke, H.G., Demidchik, E.P. & Golovneva, A. (1999) Time trends of thyroid cancer incidence in Belarus after the Chernobyl accident. *Radiat. Res.*, **151**, 617–625
- Heller, S.L. (1996) Radiation safety in the central radiopharmacy. *Semin. nucl. Med.*, **26**, 107–118
- Hellman, B., Friis, L., Vaghef, H. & Edling, C. (1999) Alkaline single cell gel electrophoresis and human biomonitoring for genotoxicity: A study on subjects with residential exposure to radon. *Mutat. Res.*, **442**, 121–132
- Henrichs, K., Paretzke, H.G., Voigt, G. & Berg, D. (1989) Measurement of Cs absorption and retention in man. *Health Phys.*, **57**, 571–578
- Henshaw, D.L., Eatough, J.P. & Richardson, R.B. (1990) Radon as a causative factor in induction of myeloid leukaemia and other cancers. *Lancet*, **335**, 1008–1012

- Herbert, R.A., Scott, B.R., Hahn, F.F., Newton, G.J., Snipes, M.B., Damon, E.G. & Boecker, B.B. (1987) The prevalence and morphology of primary pulmonary neoplasms in rats 18 months after inhalation of  $^{147}\text{Pm}$  in fused aluminosilicate particles. In: Sun, J.D. & Mewhinney, J.A., eds, *Inhalation Toxicology Research Institute Annual Report 1986–1987* (Report LMF-120), Albuquerque, NM, Inhalation Toxicology Research Institute, pp. 331–335
- Herbert, R.A., Scott, B.R., Hahn, F.F., Newton, G.J., Snipes, M.S., Damon, E.G. & Boecker, B.B. (1988) The occurrence of primary pulmonary neoplasms in rats after inhalation of Pm-147 in fused aluminosilicate particles. In: Mewhinney, J.A., Bechtold, W.E., Sun, J.D. & Coons, T.A., eds, *Annual Report of the Inhalation Toxicology Research Institute, 1987–1988* (Report LMF-121), Albuquerque, NM, Inhalation Toxicology Research Institute, pp. 234–240
- Herbert, R.A., Gillett, N.A., Rebar, A.H., Lundgren, D.L., Hoover, M.D., Chang, I.Y., Carlton, W.W. & Hahn, F.F. (1993) Sequential analysis of the pathogenesis of plutonium-induced pulmonary neoplasms in the rat: Morphology, morphometry, and cytokinetics. *Radiat. Res.*, **134**, 29–42
- Herbert, R.A., Stegelmeier, B.S., Gillett, N.A., Rebar, A.H., Carlton, W.W., Singh, G. & Hahn, F.F. (1994) Plutonium-induced proliferative lesions and pulmonary epithelial neoplasms in the rat: Immunohistochemical and ultrastructural evidence for their origin from type II pneumocytes. *Vet. Pathol.*, **31**, 366–374
- Hill, C.R. (1965) Polonium-210 in man. *Nature*, **208**, 423–428
- Hill, C.R. (1966) Polonium-210 content of human tissue in relation to dietary habits. *Science*, **152**, 1261–1262
- Hill, R.L. & Johnson, J.R. (1993) Metabolism and dosimetry of tritium. *Health Phys.*, **65**, 628–647
- Hitchman, J.W., Taylor, G.N., Eaton, J.A., Shabestari, L.R. & Angus, W. (1978) Comparison of some skeletal effects of  $^{239}\text{Pu}$  administered at 3 months vs. 17 months of age in beagles. In: Jee, W.S.S., ed., *Research in Radiobiology* (COO-119-253), Salt Lake City, University of Utah Press, pp. 169–185
- Hobbs, C.H., Barnes, J.E., McClellan, R.O., Chiffelle, T.L., Jones, R.K., Lundgren, D.L., Mauderley, J.L., Pickrell, J.A. & Rypka, E.W. (1972) Toxicity in the dog of inhaled  $^{90}\text{Y}$  in fused clay particles: Early biological effects. *Radiat. Res.*, **49**, 430–460
- Hodgkins, P.S., O'Neill, P., Stevens, D. & Fairman, M.P. (1996) The severity of alpha-particle-induced DNA damage is revealed by exposure to cell-free extracts. *Radiat. Res.*, **146**, 660–667
- Hodgson, J.T. & Jones, R.D. (1990) Mortality of a cohort of tin miners, 1941–86. *Br. J. ind. Med.*, **47**, 665–676
- Hoefnagel, C.A. (1991) Radionuclide therapy revisited. *Eur. J. nucl. Med.*, **18**, 408–431
- Hoefnagel, C.A., Clarke, S.E.M., Fischer, M., Chatal, J.F., Lewington, V.J., Nilsson, S., Troncone, L. & Vieira, M.R. (1999) Radionuclide therapy practice and facilities in Europe. *Eur. J. nucl. Med.*, **26**, 277–282
- Hoffmann, W. & Daschil, F. (1986) Dose distribution and lung cancer incidence in Thorotrast patients. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 143–146
- Holiday, D.A., Rushing, D.E., Coleman, R.D., Woolrich, P.F. & Kusnetz, H.L. (1957) *Control of Radon and Daughters in Uranium Mines and Calculations on Biologic Effects* (PHS Publ. No. 494), Washington DC, US Government Printing Office

- Hollstein, M., Bartsch, H., Wesch, H., Kure, E.H., Mustonen, R., Mühlbauer, K.-R., Spiethoff, A., Wegener, K., Wiethege, T. & Müller, K.-M. (1997) *p53* Gene mutation analysis in tumors of patients exposed to  $\alpha$ -particles. *Carcinogenesis*, **18**, 511–516
- Holm, E. & Persson, R.B. (1978) Biophysical aspects of Am-241 and Pu-241 in the environment. *Radiat. environ. Biophys.*, **15**, 261–276
- Holm, L.-E., Hall, P., Wiklund, K., Lundell, G., Berg, G., Bjelkengren, G., Cederquist, E., Ericsson, U.-B., Hallquist, A., Larsson, L.-G., Lidberg, M., Lindberg, S., Tennvall, J., Wicklund, H. & Boice, J.D., Jr (1991) Cancer risk after iodine-131 therapy for hyperthyroidism. *J. natl Cancer Inst.*, **83**, 1072–1077
- Holmberg, E.A.D., Dosne De Pasqualini, C., Arini, E., Pavlovsky, A. & Rabasa, S.L. (1964) Leukemogenic effect of radioactive phosphorus in adult and fatally exposed BALB mice. *Cancer Res.*, **24**, 1745–1748
- Holtzman, R.B. & Ilcewicz, F.H. (1966) Lead-210 and polonium-210 in tissues of cigarette smokers. *Science*, **153**, 1259–1260
- Honstead, J.F. & Brady, D.N. (1967) The uptake and retention of  $^{32}\text{P}$  and  $^{65}\text{Zn}$  from the consumption of Columbia River fish. *Health Phys.*, **13**, 455–463
- Hopewell, J.W., Coggle, J.E., Wells, J., Hamlet, R., Williams, J.P. & Charles, M.W. (1986) The acute effects of different energy beta-emitters on pig and mouse skin. *Br. J. Radiol.*, **Suppl. 19**, 47–51
- Hopewell, J.W., Sieber, V.K., Heryet, J.C., Wells, J. & Charles, M.W. (1993) Dose- and source-size-related changes in the late response of pig skin to irradiation with single doses of beta radiation from sources of differing energy. *Radiat. Res.*, **133**, 303–311
- Hornik, S. & Kaul, A. (1995) The calculated  $\alpha$ -dose and lung cancer risk in Thorotrast patients. In: van Kaick, G., Karaoglu, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides*, Singapore, World Scientific, pp. 43–46
- Hornung, R.W. & Meinhardt, T.J. (1987) Quantitative risk assessment of lung cancer in US uranium miners. *Health Phys.*, **52**, 417–430
- Hornung, R.W., Deddens, J.A. & Roscoe, R.J. (1998) Modifiers of lung cancer risk in uranium miners from the Colorado plateau. *Health Phys.*, **74**, 12–21
- Hou, D.-Y., Maruyama, Y. & Drago, J.R. (1992) Chromosome aberrations of human small cell lung cancer induced by a new  $^{111}\text{In}$ -bleomycin complex. *J. surg. Oncol.*, **51**, 236–242
- Howard, J.E., Vaswani, A. & Heotis, P. (1997) Thyroid disease among the Rongelap and Utirik population — An update. *Health Phys.*, **73**, 190–198
- Howe, G.R. & Stager, R.H. (1996) Risk of lung cancer mortality after exposure to radon decay products in the Beaverlodge cohort based on revised exposure estimates. *Radiat. Res.*, **146**, 37–42
- Howe, G.R., Nair, R.C., Newcombe, H.B., Miller, A.B. & Abbatt, J.D. (1986) Lung cancer mortality (1950–80) in relation to radon daughter exposure in a cohort of workers at the Eldorado Beaverlodge uranium mine. *J. natl Cancer Inst.*, **77**, 357–362
- Howe, G.R., Nair, R.C., Newcombe, H.B., Miller, A.B., Burch, J.D. & Abbatt, J.D. (1987) Lung cancer mortality (1950–80) in relation to radon daughter exposure in a cohort of workers at the Eldorado Port Radium uranium mine: Possible modification of risk by exposure rate. *J. natl Cancer Inst.*, **79**, 1255–1260
- Hubbard, L.M. & Swedjemark, G.A. (1993) Challenges in comparing radon data sets from the same Swedish houses: 1955–1990. *Indoor Air*, **3**, 361–368

- Humphreys, E.R., Robins, M.W. & Stones, V.A. (1985) Age-related and  $^{224}\text{Ra}$ -induced abnormalities in the teeth of male mice. *Arch. oral Biol.*, **30**, 55–64
- Humphreys, E.R., Loutit, J.F. & Stones, V.A. (1987) The induction by  $^{239}\text{Pu}$  of myeloid leukaemia and osteosarcoma in female CBA mice. *Int. J. Radiat. Biol.*, **51**, 331–339
- Humphreys, E.R., Isaacs, K.R., Raine, T.A., Saunders, J., Stones, V.A. & Wood, D.L. (1993) Myeloid leukaemia and osteosarcoma in CBA/H mice given  $^{224}\text{Ra}$ . *Int. J. Radiat. Biol.*, **64**, 231–235
- Hunt, G.J. (1998) Transfer across the human gut of environmental plutonium, americium, cobalt, caesium and technetium: Studies with cockles (*Cerastoderma edule*) from the Irish Sea. *J. Radiol. Prot.*, **18**, 101–109
- Hunt, G.J. & Allington, D.J. (1993) Absorption of environmental polonium-210 by the human gut. *J. Radiol. Prot.*, **13**, 119–126
- Hunt, G.J., Leonard, D.R.P. & Lovett, M.B. (1990) Transfer of environmental plutonium and americium across the human gut: A second study. *Sci. Total Environ.*, **90**, 273–282
- Hunt, G.J., Young, A.K. & Bonfield, R.A. (2001) Transfer across the human gut of environmental technetium in lobsters (*Homarus gammarus* L.) from the Irish Sea. *J. Radiol. Prot.*, **21**, 21–29
- Hursh, J.B., Steadman, L.T., Looney, W.B. & Colodzin, M. (1957) The excretion of thorium and thorium daughters after Thorotrast administration. *Acta radiol.*, **47**, 481–498
- Hursh, J.B., Neuman, W.R., Toribara, T., Wilson, H. & Waterhouse, C. (1969) Oral ingestion of uranium by man. *Health Phys.*, **17**, 619–621
- Hutchinson, F. (1985) Chemical changes induced in DNA by ionizing radiation. *Prog. nucl. Acid Res. mol. Biol.*, **32**, 115–154
- Huvos, A.G. (1991) *Bone Tumours: Diagnosis, Treatment and Prognosis*, 2nd Ed., Philadelphia, PA, W.B. Saunders
- Huvos, A.G. & Woodard, H.Q. (1988) Postradiation sarcomas of bone. *Health Phys.*, **55**, 631–636
- IAEA (International Atomic Energy Agency) (1997) *IAEA Yearbook 1997* (STI/PUB/1034), Vienna
- IARC (1987) *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, Suppl. 7, *Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs Volumes 1 to 42*, IARCPress, pp. 216–219
- IARC (1988) *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, Vol. 43, *Man-made Mineral Fibres and Radon*, Lyon, IARCPress
- IARC (1998) CD-ROM, Globocan 1: *Cancer Incidence and Mortality Worldwide in 1990*, Lyon, IARCPress
- IARC (2000) *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, Vol. 75, *Ionizing Radiation, Part 1: X- and Gamma ( $\gamma$ )-Radiation, and Neutrons*, Lyon, IARCPress
- Ibrahim, S.A., Wrenn, M.E., Singh, N.P., Cohen, N. & Saccomano, G. (1983) Thorium concentration in human tissues from two US populations. *Health Phys.*, **44**, 213–220
- ICRP (International Commission on Radiological Protection) (1966) Task Group on Lung Dynamics. Deposition and retention models for internal dosimetry of the human respiratory tract. *Health Phys.*, **12**, 173–207

- ICRP (International Commission on Radiological Protection) (1968) *Report of Committee IV on Evaluation of Radiation Doses to Body Tissues from Internal Contamination Due to Occupational Exposure* (ICRP Publication 10), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1973) *Alkaline Earth Metabolism in Adult Man* (ICRP Publication 20), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1975) *Report of the Task Group on Reference Man* (ICRP Publication 23), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1979) *Limits for Intakes of Radio-nuclides by Workers*, Part 1 (ICRP Publication 30; Annals of the ICRP, Vol. 2, No. 3/4), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1980) *Limits for Intakes of Radio-nuclides by Workers*, Part 2 (ICRP Publication 30; Annals of the ICRP, Vol. 4, No. 3/4), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1981) *Limits for Intakes of Radio-nuclides by Workers*, Part 3 (ICRP Publication 30; Annals of the ICRP, Vol. 6, No. 2/3), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1984) *Nonstochastic Effects of Ionizing Radiation* (ICRP Publication 41; Annals of the ICRP, Vol. 14, No. 3), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1986) *The Metabolism of Plutonium and Related Elements* (ICRP Publication 48), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1989) *Age-dependent Doses to Members of the Public from Intake of Radionuclides*, Part 1 (ICRP Publication 56; Annals of the ICRP, Vol. 20, No. 2), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1991) 1990 Recommendations of the International Commission on Radiological Protection (ICRP Publication 60; Annals of the ICRP, Vol. 21), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1993a) *Protection against Radon-222 at Home and at Work* (ICRP Publication 65; Annals of the ICRP, Vol. 23, No. 2), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1993b) *Radiation Dose to Patients from Radiopharmaceuticals* (ICRP Publication No. 53), 2nd Ed., Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1993c) *Age-dependent Doses to Members of the Public from Intake of Radionuclides*, Part 2, *Ingestion Dose Coefficients* (ICRP Publication 67; Annals of the ICRP, Vol. 23, No. 3/4), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1994a) *Dose Coefficients for Intakes of Radionuclides by Workers: Replacement of ICRP Publication 61* (ICRP Publication 68; Annals of the ICRP, Vol. 24), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1994b) *Human Respiratory Tract Model for Radiological Protection* (ICRP Publication 66; Annals of the ICRP, Vol. 26, No. 1), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1995a) *Age-dependent Doses to Members of the Public from Intake of Radionuclides*, Part 3, *Ingestion Dose Coefficients* (ICRP Publication 69; Annals of the ICRP, Vol. 25, No. 1), Oxford, Pergamon Press

- ICRP (International Commission on Radiological Protection) (1995b) *Age-dependent Doses to Members of the Public from Intake of Radionuclides*, Part 4, *Inhalation Dose Coefficients* (ICRP Publication 71; Annals of the ICRP, Vol. 25, No. 3-4), Oxford, Pergamon Press
- ICRP (International Commission on Radiological Protection) (1999) *The ICRP Database of Dose Coefficients: Workers and Members of the Public*, Version 1. CD-ROM, Oxford, Pergamon Press
- Iliakis, G. (1984) The mutagenicity of alpha particles in Ehrlich ascites tumor cells. *Radiat. Res.*, **99**, 52–58
- Ilyin, L.A., Balonov, M.I., Buldakov, L.A., Bur'yak, V.N., Gordeev, K.I., Dement'ev, S.I., Zhakov, I.G., Zubovsky, G.A., Kondrusev, A.I., Konstantinov, Y.O., Linge, I.I., Likhtarev, I.A., Lyaginskaya, A.M., Maryuhin, V.A., Pavlovsky, O.A., Potapov, A.I., Prysyazhnyuk, A.E., Ramsaev, P.V., Romanenko, A.E., Savkin, M.N., Starkova, N.T., Tron'ko, N.D. & Tsyb, A.V. (1990) Radiocontamination patterns and possible health consequences of the accident at the Chernobyl nuclear power station. *J. radiol. Prot.*, **10**, 3–29
- Ishikawa, Y., Kato, Y. & Hatakeyama, S. (1989) Late effects of alpha-particles on Thorotrast patients in Japan. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology, pp. 129–131
- Ishikawa, Y., Kato, Y., Mori, T., Machinami, R. & Kitagawa, T. (1993a) Alpha-particle dose to the liver and spleen tissues of Japanese Thorotrast patients. *Health Phys.*, **65**, 497–506
- Ishikawa, Y., Mori, T., Kato, Y., Machinami, R., Priest, N.D. & Kitagawa, T. (1993b) Systemic deposits of thorium in Thorotrast patients with particular reference to sites of minor storage. *Radiat. Res.*, **135**, 244–248
- Ishikawa, Y., Humphreys, J.A.H., Collier, C.G., Priest, N.D., Kato, Y., Mori, T. & Machinami, R. (1999) Revised organ partition of thorium-232 in Thorotrast patients. *Radiat. Res.*, **152**, S102–S106
- Ishiwata, K., Ido, T., Kawashima, K., Yamada, H., Takahashi, T., Iwata, R., Matsui, A. & Sakuragawa, N. (1985) Placental transfer of positron-emitting radionuclides in metabolic substrates. *Int. J. nucl. Med. Biol.*, **12**, 33–36
- Islam, A. (1985) Chronic granulocytic leukaemia: A defect in cellular interactions between stromal and haemopoietic stem cells? *Med. Hypoth.*, **17**, 69–77
- Ito, T., Seyama, T., Iwamoto, K.S., Hayashi, T., Mizuno, T., Tsuyama, N., Dohi, K., Nakamura, N. & Akiyama, M. (1993) *In vitro* irradiation is able to cause RET oncogene rearrangement. *Cancer Res.*, **53**, 2940–2943
- Ivanov, V.K., Tsyb, A.F., Gorsky, A.I., Maksyutov, M.A., Rastopchin, E.M., Konogorov, A.P., Biryukov, A.P., Matyash, V.A. & Mould, R.F. (1997a) Thyroid cancer among 'liquidators' of the Chernobyl accident. *Br. J. Radiol.*, **70**, 937–941
- Ivanov, V.K., Tsyb, A.F., Nilova, E.V., Efendiev, V.F., Gorsky, A.I., Pitkevich, V.A., Leshakov, S.Y. & Shiryaev, V.I. (1997b) Cancer risks in the Kaluga oblast of the Russian Federation 10 years after the Chernobyl accident. *Radiat. environ. Biophys.*, **36**, 161–167
- Ivanov, E.P., Tolochko, G.V., Shubaeva, L.P., Ivanov, V.E., Iaroshevich, R.F., Becker, S., Nekolla, E. & Kellerer, A.M. (1998) Infant leukemia in Belarus after the Chernobyl accident. *Radiat. environ. Biophys.*, **37**, 53–55

- Ivanov, V.K., Gorski, A.I., Pitkevitch, V.A., Tsyb, A.F., Cardis, E. & Storm, H. (1999a) Risk of radiogenic thyroid cancer in Russia following the Chernobyl accident. In: Thomas, G., Karaoglou, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer* (EUR 18552 EN), Singapore, World Scientific, pp. 89–96
- Ivanov, V.K., Gorsky, A.I., Tsyb, A.F., Maksyutov, M.A. & Rastopchin, E.M. (1999b) Dynamics of thyroid cancer incidence in Russia following the Chernobyl accident. *J. Radiol. Prot.*, **19**, 305–318
- Iwamoto, K.S., Fujii, S., Kurata, A., Suzuki, M., Hayashi, T., Ohtsuki, Y., Okada, Y., Narita, M., Takahashi, M., Hosobe, S., Doishita, K., Manabe, T., Hata, S., Murakami, I., Hata, S., Itoyama, S., Akatsuka, S., Ohara, N., Iwasaki, K., Akabane, H., Fujihara, M., Seyama, T. & Mori, T. (1999) p53 Mutations in tumor and non-tumor tissues of Thorotrast recipients: A model for cellular selection during radiation carcinogenesis in the liver. *Carcinogenesis*, **20**, 1283–1291
- Jackson, S. & Dolphin, G.W. (1966) The estimation of internal radiation dose from metabolic and urinary excretion data for a number of important radionuclides. *Health Phys.*, **12**, 481–500
- Jacob, P., Goulko, G., Heidenreich, W.F., Likhtarev, I., Kairo, I., Tronko, N.D., Bogdanova, T.I., Kenigsberg, J., Buglova, E., Drozdovitch, V., Golovneva, A., Demidchik, E.P., Balonov, M., Zvonova, I. & Beral, V. (1998) Thyroid cancer risk to children calculated. *Nature*, **392**, 31–32
- Jacob, P., Kenigsberg, Y., Zvonova, I., Goulko, G., Buglova, E., Heidenreich, W.F., Golovneva, A., Bratilova, A.A., Drozdovitch, V., Kruk, J., Pochtennaja, G.T., Balonov, M., Demidchik, E.P. & Paretzke, H.G. (1999) Childhood exposure due to the Chernobyl accident and thyroid cancer risk in contaminated areas of Belarus and Russia. *Br. J. Cancer*, **80**, 1461–1469
- Jacquet, N., Bourahla, K., Guiraud-Vitaux, F., Petiet, A., Voisin, P. & Colas-Linhart, N. (1999) Biological consequences of irradiation by low doses of technetium 99m: Ultrastructural studies, p53 protein expression and cytogenetic effects. *Cell. mol. Biol.*, **45**, 1139–1147
- Janower, M.L., Miettinen, O.S. & Flynn, M.J. (1972) Effects of long-term Thorotrast exposure. *Radiology*, **103**, 13–20
- Jee, W.S.S. (1972) Distribution and toxicity of  $^{239}\text{Pu}$  in bone. *Health Phys.*, **22**, 583–595
- Jee, W.S.S. & Arnold, J.S. (1960) Radioisotopes in the teeth of dogs. I. The distribution of plutonium, radium, radiothorium, mesothorium, and strontium and the sequence of histopathologic changes in teeth containing plutonium. *Arch. oral Biol.*, **2**, 215–238
- Jee, W.S.S., Arnold, J.S., Cochran, T.H., Twente, J.A. & Mical, R.S. (1962) Relationship of microdistribution of alpha-particles to damage. In: Dougherty, T.F., Jee, W.S.S., Mays, C.W. & Stover, B.J., eds, *Some Aspects of Internal Irradiation*, Oxford, Pergamon Press, pp. 27–45
- Jee, W.S.S., Bartley, M.H., Dockum, N.L., Yee, J. & Kenner, G.H. (1969) Vascular changes in bones following bone-seeking radionuclides. In: Mays, C.W., Jee, W.S.S., Lloyd, R.D., Stover, B.J., Doughterty, J.H. & Taylor, G.N., eds, *Delayed Effects of Bone-seeking Radionuclides*, Salt Lake City, University of Utah Press, pp. 437–455
- Jee, W.S., Parks, N.J., Miller, S.C. & Dell, R.B. (1986) Relationship of bone composition to the location of radium-induced bone cancer. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 75–78

- Jenner, T.J., deLara, C.M., O'Neill, P. & Stevens, D.L. (1993) Induction and rejoicing of DNA double-strand breaks in V79-4 mammalian cells following  $\gamma$ - and  $\alpha$ -irradiation. *Int. J. Radiat. Biol.*, **64**, 265–273
- Johansson, L., Mattsson, S. & Nosslin, B. (1984) Effective dose equivalent from radiopharmaceuticals. *Eur. J. nucl. Med.*, **9**, 485–489
- Johansson, L., Mattsson, S., Nosslin, B. & Leide-Svegborn, S. (1992) Effective dose from radiopharmaceuticals. *Eur. J. nucl. Med.*, **19**, 933–938
- Johnson, J.R., Myers, D.K., Jackson, J.S., Dunfor, D.W., Gragtmans, N.J., Wyatt, H.M., Jones, A.R. & Percy, D.H. (1995) Relative biological effectiveness of tritium for induction of myeloid leukemia in CBA/H mice. *Radiat. Res.*, **144**, 82–89
- Jones, D.C.L., Krebs, J.S., Sasmore, D.P. & Mitoma, C. (1980) Evaluation of neonatal squirrel monkeys receiving tritiated water throughout gestation. *Radiat. Res.*, **83**, 592–608
- Jones, C.W., Mays, C.W., Taylor G.N., Lloyd, R.D. & Packer, S.M. (1986) Reducing the cancer risk of  $^{239}\text{Pu}$  by chelation therapy. *Radiat. Res.*, **107**, 296–306
- Jönsson, H. & Mattsson, S. (1998) Thyroid burdens of  $^{125}\text{I}$  in hospital laboratory workers during a 20-y period. *Health Phys.*, **75**, 475–478
- Jorgensen, T.J., Olive, P.L. & Durand, R.E. (1987) DNA strand breakage in Chinese hamster V79 cells caused by low levels of incorporated [ $^3\text{H}$ ] and [ $^{14}\text{C}$ ]thymidine. *Int. J. Radiat. Biol.*, **51**, 673–680
- Kadhim, M.A., Macdonald, D.A., Goodhead, D.T., Lorimore, S.A., Marsden, S.J. & Wright, E.G. (1992) Transmission of chromosomal instability after plutonium  $\alpha$ -particle irradiation. *Nature*, **355**, 738–740
- Kadhim, M.A., Lorimore, S.A., Hepburn, M.D., Goodhead, D.T., Buckle, V.J. & Wright, E.G. (1994) Alpha-particle-induced chromosomal instability in human bone marrow cells. *Lancet*, **344**, 987–988
- van Kaick, G., Muth, H. & Kaul, A., eds (1984) *The German Thorotrast Study — Results of Epidemiological, Clinical and Biophysical Examinations on Radiation-induced Late Effects in Man caused by Incorporated Colloidal Thorium Dioxide (Thorotrast)* (EUR 9504 EN), Luxembourg, Office for Official Publications of the European Commission
- van Kaick, G., Muth, H., Kaul, A., Wesch, H., Immich, H., Liebermann, D., Lorenz, D., Lorenz, W.J., Lührs, H., Scheer, K.E., Wagner, G. & Wegener, K. (1986a) Report on the German Thorotrast study. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 114–118
- van Kaick, G., Wesch, H., Lührs, H. & Liebermann, D. (1986b) Radiation-induced primary liver tumors in ‘Thorotrast patients’. *Recent Results Cancer Res.*, **100**, 16–22
- van Kaick, G., Wesch, H., Lührs, H., Liebermann, D., Kaul, A. & Muth, H. (1989) The German Thorotrast study — Report on 20 years follow-up. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology, pp. 98–103
- van Kaick, G., Wesch, H., Lührs, H., Liebermann, D. & Kaul, A. (1991) Neoplastic diseases induced by chronic alpha-irradiation — Epidemiological, biophysical and clinical results of the German Thorotrast study. *J. Radiat. Res.*, **32** (Suppl. 2), 20–33

- van Kaick, G., Wesch, H., Lührs, H., Liebermann, D. & Kaul, A. (1995) Epidemiologic results and dosimetric calculations — An update of the German Thorotrast study. In: van Kaick, G., Karaoglou, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 171–175
- van Kaick, G., Dalheimer, A., Hornik, S., Kaul, A., Liebermann, D., Lührs, H., Spiethoff, A., Wegener, K. & Wesch H. (1999) The German Thorotrast Study: Recent results and assessment of risks. *Radiat. Res.*, **152**, S64–S71
- Kaletsch, U., Kaatsch, P., Meinert, R., Schüz, J., Czarwinski, R. & Michaelis, J. (1999) Childhood cancer and residential radon exposure — Results of a population-based case-control study in Lower Saxony (Germany). *Radiat. environ. Biophys.*, **38**, 211–215
- Kamikawa, T., Amenomori, M., Itoh, T., Momoi, H., Hiai, H., Machinami, R., Ishikawa, Y., Mori, T., Shimahara, Y., Yamaoka, Y. & Fukumoto, M. (1999) Analysis of genetic changes in intrahepatic cholangiocarcinoma induced by Thorotrast. *Radiat. Res.*, **152**, S118–S124
- Kammer, H. & Goodman, M.J. (1959) Sterility after radioiodine therapy for metastatic thyroid carcinoma. *J. Am. med. Assoc.*, **171**, 1963–1965
- Kampf, G. & Eichhorn, K. (1983) DNA strand breakage by different radiation qualities and relations to cell-killing — Further results after the influence of alpha particles and carbon ions. *Studia biophys.*, **93**, 17–26
- Kapoor, G., Sharan, R.N. & Srivastava, P.N. (1985) Histopathological changes in the ovary following acute and chronic low-level tritium exposure in mice *in vivo*. *Int. J. Radiat. Biol.*, **47**, 197–203
- Kashima, M., Mahlum, D.D. & Sikov, M.R. (1972) Metabolism and effect of monomeric and polymeric plutonium in the immature rat liver. *Health Phys.*, **22**, 749–752
- Kathren, R.L. & Hill, R.L. (1992) Distribution and dosimetry of Thorotrast in USUR Case 1001. *Health Phys.*, **63**, 72–88
- Kathren, R.L., Heid, K.R. & Swint, M.J. (1987) Comparison of estimates of systemic Pu from urinary excretion with estimates from post-mortem tissue analysis. *Health Phys.*, **53**, 487–493
- Kato, Y. & Ishikawa, Y. (1992) Portable  $^{220}\text{Rn}$  detector used to assess Thorotrast exposure. *Health Phys.*, **63**, 119–123
- Kato, Y., Mori, T. & Kumatori, T. (1983) Estimated absorbed dose in tissues and radiation effects in Japanese Thorotrast patients. *Health Phys.*, **44** (Suppl. 1), 273–279
- Katz, N., Ésik, O., Füzy, M. & Gundy, S. (1998) [Cytogenetic study of thyroid patients treated with external irradiation or radioiodine.] *Orv. Hetil.*, **139**, 1521–1526 (in Hungarian)
- Kaul, A. (1965) Dose in liver and spleen after injection of Thorotrast into blood. In: *The Dosimetry and Toxicity of Thorotrast* (IAEA Technical Report 1968), Vienna, International Atomic Energy Agency, pp. 30–43
- Kaul, A. (1973) Mean organ dose rates in man following intravascular injection of Thorotrast. In: *Proceedings of the Third International Meeting on the Toxicity of Thorotrast* (Risø Report No. 294), Copenhagen, Danish Atomic Energy Commission, Research Establishment Risø, pp. 40–51
- Kaul, A. (1995) Biokinetic models and data. In: van Kaick, H., Karaoglou, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 53–67

- Kaul, A. & Muth, H. (1978) Thorotrast kinetics and radiation dose. Results from studies in Thorotrast patients and from animal experiments. *Radiat. environ. Biophys.*, **15**, 241–259
- Kaul, A. & Noffz, W. (1978) Tissue dose in Thorotrast patients. *Health Phys.*, **35**, 113–121
- Kaul, A., Pustelnik, B., Pustelnik, C. & Riedel, W. (1986) Assessment of Thorotrast redistribution in liver tissue of the rat. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 189–196
- Kawamura, H., Tanaka, G.-I. & Shiraishi, K. (1986) Distribution of Sr in the fetal skeleton. *Health Phys.*, **50**, 159–162
- Keane, A.T., Lucas, H.F., Markun, F., Essling, M.A. & Holtzman, R.B. (1986) The estimation and potential radiobiological significance of the intake of  $^{228}\text{Ra}$  by early Ra dial workers in Illinois. *Health Phys.*, **51**, 313–327
- Keating, F.R., Jr & Albert, A. (1949) The metabolism of iodine in man as disclosed with the use of radioiodine. *Recent Prog. Hormone Res.*, **4**, 429–481
- Kellington, J.P., Gibson, K., Buckle, T.M., Talbot, R.J. & Hornby, S.B. (1992) Alveolar macrophage kinetics after inhalation of  $^{239}\text{PuO}_2$  by CBA/Ca mice: Changes in synthesis of DNA. *Environ. Health Perspect.*, **97**, 69–75
- Kellington, J.P., Eldred, T.M., Ambrose, K., Brooks, P.N. & Priest, N.D. (1998) Effects of radiation quality on lung tumour induction in CBA/Ca mice. In: Hare, G.A., Cartwright, R.A., Chadwick, K., Charles, M.W., Fry, S.A., Goodhead, D.T. & Wade, B., eds, *Health Effects of Low Dose Radiation: Challenge of 21st Century*, London, Thomas Telford, pp. 44–51
- Kelly, G., Stegelmeier, B.L. & Hahn, F.F. (1995) *p53* alterations in plutonium-induced F344 rat lung tumors. *Radiat. Res.*, **142**, 263–269
- Kenigsberg, J., Buglova, E., Paretzke, H.G. & Heidenreich, W. (1996) Perspectives of development of thyroid cancer in Belarus. In: Karaoglu, A., Desmet, G., Kelly, G.N. & Menzel, H.G., eds, *The Radiological Consequences of the Chernobyl Accident* (EUR 16544 EN), Luxembourg, Office for Official Publications of the European Commission, pp. 771–775
- Kerber, R.A., Till, J.E., Simon, S.L., Lyon, J.L., Thomas, D.C., Preston-Martin, S., Rallison, M.L., Lloyd, R.D. & Stevens, W. (1993) A cohort study of thyroid disease in relation to fallout from nuclear weapons testing. *J. Am. med. Assoc.*, **270**, 2076–2082
- Khokhryakov, V.F. & Kudryavtseva, T.I. (1985) [Distribution of plutonium-239 in the body of workers at the radiochemical plant.] *Bull. Radiat. Med.*, **2**, 74–80 (in Russian)
- Khokhryakov, V.F. & Romanov, S.A. (1992) [Lung cancer effect of radiation exposure.] *Sci. inform. method. Bull.*, **4**, 16–17 (in Russian)
- Khokhryakov, V.F. & Romanov, S.A. (1994) Lung cancer in radiochemical industry workers. *Sci. total Environ.*, **142**, 25–28
- Khokhryakov, V.F. & Romanov, S.A. (1996) Estimation of the temporal distribution and dose dependency of lung cancers among workers of nuclear fuel reprocessing plants. *Health Phys.*, **71**, 83–85
- Khokhryakov, V.F., Erochin, R.A. & Koshurnikova, N.A. (1988) [Forecast of frequency of arising carcinoma of lung by the staff involved into plutonium production.] *Bull. Radiat. Med.*, **1**, 23–28 (in Russian)
- Khokhryakov, V.F., Kudryavtseva, T.I. & Suslova, K.G. (1990) [Effective dose equivalent of irradiation of the staff by incorporated plutonium.] *Bull. Radiat. Med.*, **2**, 77–81 (in Russian)

- Khokhryakov, V.F., Kellerer, A.M., Kreisheimer, M. & Romanov, S.A. (1998) Lung cancer in nuclear workers of Mayak. A comparison of numerical procedures. *Radiat. environ. Biophys.*, **37**, 11–17
- Khursheed, A. (2000) Doses to systemic tissues from radon gas. *Radiat. Prot. Dosim.*, **88**, 171–181
- Kido, C., Sasaki, F., Hirota, Y., Kiyosawa, K., Hayashi, S., Mori, T. & Sobue, T. (1999) Cancer mortality of Thorotrast patients in Japan: The second series updated 1998. *Radiat. Res.*, **152**, S81–S83
- Klugbauer, S., Lengfelder, E., Demidchik, E.P. & Rabes, H.M. (1995) High prevalence of RET rearrangement in thyroid tumors of children from Belarus after the Chernobyl reactor accident. *Oncogene*, **11**, 2459–2467
- Kobayashi, T., Kageyama, N. & Ohara, K. (1981) Internal irradiation for cystic craniopharyngioma. *J. Neurosurg.*, **55**, 896–903
- Koletsky, S., Bonte, F.J. & Friedell, H.L. (1950) Production of malignant tumours in rats with radioactive phosphorus. *Cancer Res.*, **10**, 129–138
- Komatsu, K., Okumura, Y. & Sakamoto, K. (1990) Radiation dose to mouse liver cells from ingestion of tritiated food or water. *Health Phys.*, **58**, 625–629
- Koshurnikova, N.A. & Nifatov, A.P. (1978) [Carcinoma of lung by workers involved into plutonium production.] *Bull. Radiat. Med.*, **4**, 60–66 (in Russian)
- Koshurnikova, N.A., Lemberg, V.K., Mamakova, O.V., Nifatov, A.P. & Surov, A.I. (1973) [Some late health effects of exposure to inhaled plutonium-239 in man.] *Bull. Radiat. Med.*, **1**, 3–17 (in Russian)
- Koshurnikova, N.A., Komleva, N.S., Bysogolov, G.D., Bolotnikova, M.G., Budushchev, E.B., Buldakov, L.A., Lizlov, A.F., Mensikh, Z.S., Nifatov, A.P. & Khokhryakov, V.F. (1992) [Effect of radiation exposure in workers of the 'Mayak' PA.] *Sci. inform. method. Bull.*, **4**, 18–21 (in Russian)
- Koshurnikova, N.A., Kreslov, V.V., Bolotnikova, M.G., Nifatov, A.P., Shilnikova, N.S., Okatenko, P.V., Romanov, S.A. & Khokhryakov, V.F. (1995) [Lung cancer mortality among personnel of 'Mayak' complex.] *Radiat. Risk*, **5**, 145–150 (in Russian)
- Koshurnikova, N.A., Bysogolov, G.D., Bolotnikova, M.G., Khokhryakov, V.F., Kreslov, V.V., Okatenko, P.V., Romanov, S.A. & Shilnikova, N.S. (1996) Mortality among personnel who worked at the Mayak complex in the first years of its operation. *Health Phys.*, **71**, 90–93
- Koshurnikova, N.A., Shilnikova, N.S., Okatenko, P.V., Kreslov, V.V., Bolotnikova, Romanov, S.A. & Sokolnikov, M.E. (1997a) The risk of cancer among nuclear workers at the 'Mayak' Production Association: Preliminary results of an epidemiological study. In: Boice, J.D., Jr, ed., *Implications of New Data on Radiation Cancer Risk* (NCRP Proceedings No. 18), Bethesda, MD, National Council on Radiation Protection and Measurements, pp. 113–122
- Koshurnikova, N.A., Kreslov, V.V., Okatenko, P.V., Romanov, S.A., Shilnikova, N.S. & Sokolnikov, M.E. (1997b) Epidemiological effects and lung cancer risk due to radiation exposure. In: Kellogg, S.L. & Kirk, E.J., eds, *Assessing Health and Environmental Risks from Long-term Radiation Contamination in Chelyabinsk, Russia* (Proceedings of the 1996 AAAS Annual Meeting Symposium), Washington DC, American Association for the Advancement of Science, pp. 61–70

- Koshurnikova, N.A., Bolotnikova, M.G., Ilyin, L.A., Keirim-Markus, I.B., Menshikh, Z.S., Okatenko, P.V., Romanov, S.A., Tsvetkov, V.I. & Shilnikova, N.S. (1998) Lung cancer risk due to exposure to incorporated plutonium. *Radiat. Res.*, **149**, 366–371
- Koshurnikova, N.A., Shilnikova, N.S., Okatenko, P.V., Kreslov, V.V., Bolotnikova, M.G., Sokolnikov, M.E., Khokhriakov, V.F., Suslova, K.G., Vassilenko, E.K. & Romanov, S.A. (1999) Characteristics of the cohort of workers at the Mayak nuclear complex. *Radiat. Res.*, **152**, 352–363
- Koshurnikova, N.A., Gilbert, E.S., Sokolnikov, M.E., Khokhryakov, V., Miller, S., Preston, D.L., Romanov, S.A., Shilnikova, N.S., Suslova, K.G. & Vostrotin, V.V. (2000) Bone tumors in Mayak workers. *Radiat. Res.*, **154**, 237–245
- Kossenko, M.M. (1996) Cancer mortality in the exposed population of the Techa River area. *World Health Stat. Q.*, **49**, 17–21
- Kossenko, M.M. & Degteva, M.O. (1994) Cancer mortality and radiation risk evaluation for the Techa River population. *Sci. total Environ.*, **142**, 73–89
- Kossenko, M.M., Degteva, M.O., Vyushkova, O.V., Preston, D.L., Mabuchi, K. & Kozheurov, V.P. (1997) Issues in the comparison of risk estimates for the population in the Techa River region and atomic bomb survivors. *Radiat. Res.*, **148**, 54–63
- Kozheurov, V.P. & Degteva, M. (1994) Dietary intake evaluation and dosimetric modelling for the Techa River residents based on in vivo measurements of strontium-90 in teeth and skeleton. *Sci. total Environ.*, **142**, 67–72
- Kreienbrock, L., Kreuzer, M., Gerken, M., Dingerkus, G., Wellmann, J., Keller, G. & Wichmann, H.E. (2000) Case-control study on lung cancer and residential radon in West Germany. *Am. J. Epidemiol.* (in press)
- Kreisheimer, M., Koshurnikova, N.A., Nekolla, E., Khokhryakov, V.F., Romanov, S.A., Sokolnikov, M.E., Shilnikova, N.S., Okatenko, P.V. & Kellerer, A.M. (2000) Lung cancer mortality among male nuclear workers of the Mayak facilities in the former Soviet Union. *Radiat. Res.*, **154**, 3–11
- Kreuzer, M., Grosche, B., Brachner, A., Martignoni, K., Schnelzer, M., Schopka, H.-J., Brüske-Hohlfeld, I., Wichmann, H.-E. & Burkart, W. (1999) The German uranium miners cohort study: Feasibility and first results. *Radiat. Res.*, **152**, S56–S58
- Kusiak, R.A., Ritchie, A.C., Muller, J. & Springer, J. (1993) Mortality from lung cancer in Ontario uranium miners. *Br. J. ind. Med.*, **50**, 920–928
- Kwadow, M. & Chevalier, C. (1988) Occupational exposure to radionuclides in French nuclear power plants: Five years excretion monitoring results. *Sci. total Environ.*, **70**, 299–319
- L'Abbé, K.A., Howe, G.R., Burch, J.D., Miller, A.B., Abbatt, J., Band, P., Choi, W., Du, J., Feather, J., Gallagher, R., Hill, G. & Matthews, V. (1991) Radon exposure, cigarette smoking, and other mining experience in the Beaverlodge uranium miners cohort. *Health Phys.*, **60**, 489–495
- LaBauve, R.J., Brooks, A.L., Mauderly, J.L., Hahn, F.F., Redman, H.C., Macken, C., Slauson, D.O., Mewhinney, J.A. & McClellan, R.O. (1980) Cytogenetic and other biological effects of  $^{239}\text{PuO}_2$  inhaled by the rhesus monkey. *Radiat. Res.*, **82**, 310–335
- Ladinskaya, L.A., Parfenov, Y.D., Popov, D.K. & Fedorova, A.V. (1973)  $^{210}\text{Pb}$  and  $^{210}\text{Po}$  content in air, water, foodstuffs, and the human body. *Arch. environ. Health*, **27**, 254–258
- Lagarde, F. & Pershagen, G. (1999) Parallel analyses of individual and ecologic data on residential radon, cofactors, and lung cancer in Sweden. *Am. J. Epidemiol.*, **149**, 268–274

- Lagarde, F., Pershagen, G., Åkerblom, G., Axelson, O., Bäverstam, U., Damber, L., Enflo, A., Svartengren, M. & Swedjemark, G.A. (1997) Residential radon and lung cancer in Sweden: Risk analysis accounting for random error in the exposure assessment. *Health Phys.*, **72**, 269–276
- Lagerquist, C.R., Bokowski, D.L., Hammond, S.E. & Hylton, D.B. (1969) Plutonium content of several internal organs following occupational exposure. *Am. Ind. Hyg. Assoc. J.*, **30**, 417–421
- Laird, N.M. (1987) Thyroid cancer risk from exposure to ionizing radiation: A case study in the comparative potency model. *Risk Anal.*, **7**, 299–309
- Lambert, B.E. & M.L. Phipps (1977) Some effects of irradiation of mice in utero with tritiated compounds. *Curr. Topics Radiat. Res. Q.*, **12**, 197–211
- Lambert, B.E. & M.L. Phipps (1983) The long-term effects of tritium incorporated *in utero*. In: *Effects of Prenatal Irradiation with Special Emphasis on Late Effects* (Report EUR-8076), Luxembourg, Commission of the European Communities, pp. 143–158
- Landaw, S.A. (1976) Acute leukemia in polycythemia vera. *Semin. Hematol.*, **13**, 33–48
- Langham, W.H. (1957) Excretion methods: The application of excretion analyses to the determination of body burden of radioactive isotopes. *Br. J. Radiol.*, **Suppl. 7**, 95–113
- Larsen, P.R., Conard, R.A., Knudsen, K., Robbins, J., Wolff, J., Rall, J.E. & Dobyns, B. (1978) Thyroid hypofunction appearing as a delayed manifestation of accidental exposure to radioactive fall-out in a Marshallese population. In: *Late Biological Effects of Ionizing Radiation*, Vol. 1 (IAEA-SM-224/607), Vienna, International Atomic Energy Agency, pp. 101–115
- Laskey, J.W., Parrish, J.L. & Cahill, D.F. (1973) Some effects of lifetime parental exposure to low levels of tritium on the F2 generation. *Radiat. Res.*, **56**, 171–179
- La Vecchia, C., Ron, E., Franceschi, S., Dal Maso, L., Mark, S.D., Chatenoud, L., Braga, C., Preston-Martin, S., McTiernan, A., Kolonel, L., Mabuchi, K., Jin, F., Wingren, G., Galanti, M.R., Hallquist, A., Lund, E., Levi, F. & Linos, D. (1999) A pooled analysis of case-control studies of thyroid cancer. III. Oral contraceptives, menopausal replacement therapy and other female hormones. *Cancer Causes Control*, **10**, 157–166
- Law, G.R., Kane, E.V., Roman, E., Smith, A. & Cartwright, R. (2000) Residential radon exposure and adult acute leukaemia (Letter to the Editor). *Lancet*, **355**, 1888
- Lawrence, J.H. (1955) *Polycythemia. Physiology, Diagnosis and Treatment Based on 303 Cases, a Modern Medical Monograph*, New York, Grune & Stratton
- Lawrence, J.H., Winchell, H.S. & Donald, W.G. (1969) Leukemia in polycythemia vera. Relationship to splenic myeloid metaplasia and therapeutic radiation dose. *Ann. intern. Med.*, **70**, 763–771
- Lazjuk, G.I., Nikolaev, D.L. & Novikova, I.V. (1997) Changes in registered congenital anomalies in the Republic of Belarus after the Chernobyl accident. *Stem Cells*, **15**, (Suppl. 2), 255–260
- Lee, W., Chiachierini, R.P., Schleien, B. & Telles, N.C. (1982) Thyroid tumors following  $^{131}\text{I}$  or localized X irradiation to the thyroid and pituitary glands in rats. *Radiat. Res.*, **92**, 307–319
- Lee, P.S., Gorski, R.A., Hering, W.E. & Chan, T.L. (1987) Lung clearance of inhaled particles after exposure to carbon black generated from a resuspension system. *Environ. Res.*, **43**, 364–373

- Lee, D.S., Ahn, J.Y., Kim, S.K., Oh, B.H., Seo, J.D., Chung, J.-K. & Lee, M.C. (2000) Limited performance of quantitative assessment of myocardial function by thallium-201 gated myocardial single-photon emission tomography. *Eur. J. nucl. Med.*, **27**, 185–191
- Lees, R.E.M., Steele, R. & Roberts, J.H. (1987) A case-control study of lung cancer relative to domestic radon exposure. *Int. J. Epidemiol.*, **16**, 7–12
- Leggett, R.W. (1985) A model of retention, translocation, and excretion of systemic plutonium. *Health Phys.*, **49**, 1115–1137
- Leggett, R.W. (1986) Predicting the retention of Cs in individuals. *Health Phys.*, **50**, 747–759
- Leggett, R.W. (1992a) A generic age-specific biokinetic model for calcium-like elements. *Radiat. Prot. Dosim.*, **41**, 183–198
- Leggett, R.W. (1992b) A retention-excretion model for americium in humans. *Health Phys.*, **62**, 288–310
- Leggett, R.W. & Harrison, J.D. (1995) Fractional absorption of ingested uranium in humans. *Health Phys.*, **68**, 484–498
- Leggett, R.W., Eckerman, K.F. & Williams, L.R. (1982) Strontium-90 in bone: A case study in age-dependent dosimetric modeling. *Health Phys.*, **43**, 307–322
- Lehane, M.M., Bryant, P.E., Riches, A.C., Allen, L.A., Briscoe, C.V., Melville, J. & Mill, A.J. (1999)  $^{238}\text{Pu}$   $\alpha$ -particle-induced C3H10T1/2 transformants are less tumorigenic than the X-ray-induced equivalent. *Carcinogenesis*, **20**, 35–40
- LeMotte, P.K., Adelstein, S.J. & Little, J.B. (1982) Malignant transformation induced by incorporated radionuclides in BALB/3T3 mouse embryo fibroblasts. *Proc. natl Acad. Sci. USA*, **79**, 7763–7767
- LeRoy, G.V., Rust, J.H. & Hasterlik, R.J. (1966) The consequences of ingestion by man of real and simulated fall-out. *Health Phys.*, **12**, 449–473
- Lessard, E., Miltenberger, R., Conard, R., Musolino, S., Naidu, J., Moorthy, A. & Schopfer, C. (1985) *Thyroid Absorbed Dose for People at Rongelap, Utinik and Sifo on March 1, 1954* (BNL 51882), Upton, NY, Brookhaven National Laboratory
- Létourneau, E.G., Krewski, D., Choi, N.W., Goddard, M.J., McGregor, R.G., Zielinski, J.M. & Du, J. (1994) Case-control study of residential radon and lung cancer in Winnipeg, Manitoba, Canada. *Am. J. Epidemiol.*, **140**, 310–322
- Levack, V.M., Pottinger, H., Ham, G.J., Harrison, J.D. & Paquet, F. (1994) The fetal transfer of ruthenium, cerium, plutonium and americium. In: Nimmo-Scott, W. & Golding, D.J., eds, *Proceedings of the IRPA Regional Congress on Radiological Protection, June 1994, Portsmouth*, Ashford, Nuclear Technology Publishing, pp. 161–164
- Levdik, T.I., Lemberg, V.K., Buldakov, L.A., Lyubchanskii, E.R. & Pesternikov, V.M. (1972) Biological effectiveness of  $^{237}\text{Np}$ . *Health Phys.*, **22**, 643–645
- Levine, W.G. (1979) The chelation of heavy metals. In: *International Encyclopedia of Pharmacology and Therapeutics*, Oxford, Pergamon Press, Section 70
- Liebermann, D., Lührs, H. & van Kaick, G. (1995) Late effects by paravascular Thorotrast deposits. In: van Kaick, G., Karaoglou, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 271–274
- Lindholm, C., Makelainen, I., Paile, W., Koivisto, A. & Salomaa, S. (1999) Domestic radon exposure and the frequency of stable or unstable chromosomal aberrations in lymphocytes. *Int. J. Radiat. Biol.*, **75**, 921–928

- Lindsay, S., Potter, G.D. & Chaikoff, I.L. (1957) Thyroid neoplasms in the rat: A comparison of naturally occurring and  $I^{131}$ -induced tumours. *Cancer Res.*, **17**, 183–189
- Lisco, H. (1956) Bone as a critical organ for the deposition of radioactive materials. In: Wolstenholme, G.E.W. & O'Connor, C.M., eds, *Ciba Foundation Symposium on Bone Structure and Metabolism*, London, Churchill, pp. 272–283
- Little, J.B. (2000) Radiation carcinogenesis. *Carcinogenesis*, **21**, 397–404
- Little, J.B., Kennedy, A.R. & McGandy, R.B. (1978a) Effect of dose distribution on the induction of experimental lung cancer by alpha radiation. *Radiat. Res.*, **35**, 595–606
- Little, J.B., McGandy, R.B. & Kennedy, A.R. (1978b) Interactions between polonium-210  $\alpha$ -radiation, benzo[a]pyrene, and 0.9% NaCl solution instillations in the induction of experimental lung cancer. *Cancer Res.*, **38**, 1929–1935
- Little, J.B., Nagasawa, H., Pfenning, T. & Vetrovs, H. (1997) Radiation-induced genomic instability: Delayed mutagenic and cytogenetic effects of X rays and alpha particles. *Radiat. Res.*, **148**, 299–307
- Littlefield, L.G., Travis, L.B., Sayer, A.M., Voelz, G.L., Jensen, R.H. & Boice, J.D., Jr (1997) Cumulative genetic damage in hematopoietic stem cells in a patient with a 40-year exposure to alpha particles emitted by thorium dioxide. *Radiat. Res.*, **148**, 135–144
- Liu, Z., Lee, T.-S. & Kotek, T. J. (1992) Mortality among workers in a thorium-processing plant — A second follow-up. *Scand. J. Work Environ. Health*, **18**, 162–168
- Lloyd, E.L. & Henning, C.B. (1983) Cells at risk for the production of bone tumors in radium exposed individuals: An electron microscope study. *Health Phys.*, **44** (Suppl. 1), 135–148
- Lloyd, E.L., Gemmell, M.A., Henning, C.B., Gemmell, D.S. & Zabransky, B.J. (1979) Transformation of mammalian cells by alpha particles. *Int. J. Radiat. Biol.*, **36**, 467–478
- Lloyd, D.C., Edwards, A.A., Prosser, J.S., Auf der Maur, A., Etzweiler, A., Weickhardt, U., Gössi, U., Geiger, L., Noelpp, U. & Rösler, H. (1986) Accidental intake of tritiated water: A report of two cases. *Radiat. Prot. Dosim.*, **15**, 191–196
- Lloyd, R.D., Bruenger, F.W., Miller, S.C., Angus, W., Taylor, G.N., Jee, W.S. & Polig, E. (1991) Distribution of radium-induced bone cancers in beagles and comparison with humans. *Health Phys.*, **60**, 435–438
- Lloyd, R.D., Taylor, G.N., Angus, W., Bruenger, F.W. & Miller, S.C. (1993) Bone cancer occurrence among beagles given  $^{239}\text{Pu}$  as young adults. *Health Phys.*, **64**, 45–51
- Lloyd, R.D., Taylor, G.N., Angus, W., Bruenger, F.W. & Miller, S.C. (1994a) Eye tumours and other lesions among beagles given  $^{90}\text{Sr}$  or  $^{226}\text{Ra}$ . *Health Phys.*, **66**, 346–349
- Lloyd, R.D., Taylor, G.N., Angus, W., Miller, S.C., Bruenger, F.W. & Jee, W.S. (1994b) Distribution of skeletal malignancies in beagles given  $^{239}\text{Pu}$  citrate. *Health Phys.*, **66**, 407–413
- Lloyd, R.D., Miller, S.C., Taylor, G.N., Bruenger, F.W., Jee, W.S. & Angus W. (1994c) Relative effectiveness for bone cancer induction in beagles exposed to  $^{239}\text{Pu}$  and some other internal emitters. *Health Phys.*, **67**, 346–353
- Lloyd, R.D., Angus, W., Taylor, G.N., Bruenger, F.W. & Miller, S.C. (1995) Soft tissue tumors induced by monomeric  $^{239}\text{Pu}$ . *Health Phys.*, **69**, 530–537
- Lloyd, R.D., Miller, S.C., Taylor, G.N., Bruenger, F.W., Angus, W. & Jee, W.S.S. (1997a) Comparison of internal emitter radiobiology in animals and humans. *Health Phys.*, **72**, 100–110
- Lloyd, R.D., Taylor, G.N., Miller, S.C., Bruenger, F.W. & Jee, W.S. (1997b) Bone tumor location in beagles given skeletal irradiation by  $^{239}\text{Pu}$  or  $^{226}\text{Ra}$ . *Health Phys.*, **73**, 684–689

- Lloyd, D.C., Finnion, P., Edwards, A.A. & Haines, J.W. (1997c) Chromosome aberrations in Syrian hamsters following very low radiation doses *in vivo*. *Mutat. Res.*, **377**, 63–68
- Lloyd, D.C., Moquet, J.E., Oram, S., Edwards, A.A. & Lucas, J.N. (1998) Accidental intake of tritiated water: A cytogenetic follow-up case on translocation stability and dose reconstruction. *Int. J. Radiat. Biol.*, **73**, 543–547
- Lloyd, R.D., Taylor, G.N., Jee, W.S.S. & Miller, S.C. (1999a) Relative radiosensitivity of bone tumor induction among beagles as a function of age at injection of  $^{239}\text{Pu}$  or  $^{226}\text{Ra}$ . *Health Phys.*, **76**, 50–56
- Lloyd, R.D., Miller, S.C., Taylor, G.N. & Bowman, B.M. (1999b) Is there a difference in radionuclide-induced bone tumor sensitivity between male and female beagles? *Health Phys.*, **77**, 178–182
- Lomas, P.R. & Green, B.M.R. (1994) Temporal variations of radon levels in dwellings. *Radiat. Prot. Dosim.*, **56**, 323–325
- Loomis, D.P. & Wolf, S.H. (1996) Mortality of workers at a nuclear materials production plant at Oak Ridge, Tennessee, 1947–1990. *Am. J. Ind. Med.*, **29**, 131–141
- Lord, B.I., Molineux, G., Humphreys, E.R. & Stones, V.A. (1991) Long-term effects of plutonium-239 and radium-226 on the distribution and performance of pluripotent haemopoietic progenitor cells and their regulatory microenvironment. *Int. J. Radiat. Biol.*, **59**, 211–227
- Lord, B.I., Woolford, L.B., Wang, L., Stones, V.A., McDonald, D., Lorimore, S.A., Papworth, D., Wright, E.G. & Scott, D. (1998a) Tumour induction by methyl-nitroso-urea following preconceptual paternal contamination with plutonium-239. *Br. J. Cancer*, **778**, 301–311
- Lord, B.I., Woolford, L.B., Wang, L., Stones, V.A., McDonald, D., Lorimore, S.A., Papworth, D., Wright, E.G. & Scott, D. (1998b) Induction of lympho-haemopoietic malignancy: Impact of preconception paternal irradiation. *Int. J. Radiat. Biol.*, **74**, 721–728
- Lord, B.I., Woolford, L.B., Wang, L., McDonald, D., Lorimore, S.A., Stones, V.A., Wright, E.G. & Scott, D. (1998c) Induction of lympho-haemopoietic malignancy: Impact of preconception paternal irradiation. *Int. J. Radiat. Biol.*, **74**, 721–728.
- Lorimore, S.A., Kadhim, M.A., Pocock, D.A., Papworth, D., Stevens, D.L., Goodhead, D.T. & Wright, E.G. (1998) Chromosomal instability in the descendants of unirradiated surviving cells after  $\alpha$ -particle irradiation. *Proc. natl Acad. Sci. USA*, **95**, 5730–5733
- Lubin, J.H. (1998a) On the discrepancy between epidemiologic studies in individuals of lung cancer and residential radon and Cohen's ecologic regression. *Health Phys.*, **75**, 4–10
- Lubin, J.H. (1998b) Rejoinder: Cohen's response to 'on the discrepancy between epidemiologic studies in individuals of lung cancer and residential radon and Cohen's ecologic regression'. *Health Phys.*, **75**, 29–30
- Lubin, J.H. (1998c) The influence of residential radon exposure on the estimation of exposure-response trends for lung cancer in underground miners exposed to radon. *Radiat. Res.*, **150**, 259–261
- Lubin, J. (1999) Discussion: Indoor radon and risk of lung cancer. *Radiat. Res.*, **151**, 105–106
- Lubin, J.H. & Boice, J.D., Jr (1997) Lung cancer risk from residential radon: Meta-analysis of eight epidemiologic studies. *J. natl Cancer Inst.*, **89**, 49–57
- Lubin, J.H., Boice, J.D., Jr, Edling, C., Hornung, R.W., Howe, G., Kunz, E., Kusiak, R.A., Morrison, H.I., Radford, E.P., Samet, J.M., Tirmarche, M., Woodward, A., Yao, X.S. & Pierce, D.A. (1994a) *Radon and Lung Cancer Risk: A Joint Analysis of 11 Underground Studies* (NIH Publication No. 94-3644), Bethesda, MD, National Cancer Institute

- Lubin, J.H., Liang, Z.-L., Hrubec, Z., Pershagen, G., Schoenberg, J.B., Blot, W.J., Klotz, J.B., Xu, Z.-Y. & Boice, J.D., Jr (1994b) Radon exposure in residences and lung cancer among women: Combined analysis of three studies. *Cancer Causes Control*, **5**, 114–128
- Lubin, J.H., Boice, J.D., Jr, Edling, C., Hornung, R.W., Howe, G.R., Kunz, E., Kusiak, R.A., Morrison, H.I., Radford, E.P., Samet, J.M., Tirmarche, M., Woodward, A., Yao, X.S. & Pierce, D.A. (1995a) Lung cancer in radon-exposed miners and estimation of risk from indoor exposure. *J. natl Cancer Inst.*, **87**, 817–827
- Lubin, J.H., Boice, J.D., Jr, Edling, C., Hornung, R.W., Howe, G., Kunz, E., Kusiak, R.A., Morrison, H.I., Radford, E.P., Samet, J.M., Tirmarche, M., Woodward, A. & Yao, S.X. (1995b) Radon-exposed underground miners and inverse dose-rate (protraction enhancement) effects. *Health Phys.*, **69**, 494–500
- Lubin, J.H., Tomášek, L., Edling, C., Hornung, R.W., Howe, G.R., Kunz, E., Kusiak, R.A., Morrison, H.I., Radford, E.P., Samet, J.M., Tirmarche, M., Woodward, A. & Yao, X.S. (1997) Estimating lung cancer mortality from residential radon using data from low exposures of miners. *Radiat. Res.*, **147**, 126–134
- Lubin, J.H., Linet, M.S., Boice, J.D., Jr, Buckley, J., Conrath, S.M., Hatch, E.E., Kleinerman, R.A., Tarone, R.E., Wacholder, S. & Robison, L.L. (1998) Case-control study of childhood acute lymphoblastic leukemia and residential radon exposure. *J. natl Cancer Inst.*, **90**, 294–300
- Lucie, N.P. (1989) Radon exposure and leukaemia (Letter to the Editor). *Lancet*, **ii**, 99–100
- Luebeck, E.G., Heidenreich, W.F., Hazelton, W.D., Paretzke, H.G. & Moolgavkar, S.H. (1999) Biologically based analysis of the data for the Colorado uranium miners cohort: Age, dose and dose-rate effects. *Radiat. Res.*, **152**, 339–351
- Lundgren, D.L., McClellan, R.O., Thomas, R.L., Hahn, F.F. & Sanchez, A. (1974) Toxicity of inhaled  $^{144}\text{CeO}_2$  in mice. *Radiat. Res.*, **58**, 448–461
- Lundgren, D.L., Hahn, F.F. & McClellan, R.O. (1980a) Influence of age at the time of inhalation exposure to aerosols of  $^{144}\text{CeO}_2$  on  $^{144}\text{Ce}$  retention, dosimetry and toxicity in mice. *Health Phys.*, **38**, 643–655
- Lundgren, D.L., McClellan, R.O., Hahn, F.F., Newton, G.J. & Diel, J.H. (1980b) Repeated inhalation exposure of mice to  $^{144}\text{CeO}_2$ . I. Retention and dosimetry. *Radiat. Res.*, **82**, 106–122
- Lundgren, D.L., Hahn, F.F. & McClellan, R.O. (1982) Effects of single and repeated inhalation exposure of Syrian hamsters to aerosols of  $^{144}\text{CeO}_2$ . *Radiat. Res.*, **90**, 374–394
- Lundgren D.L., Gillett, N.A., Hahn, F.F., Griffith, W.C. & McClellan, R.O. (1987) Effects of protraction of the alpha dose to the lungs of mice by repeated inhalation exposure to aerosols of  $^{239}\text{PuO}_2$ . *Radiat. Res.*, **111**, 201–224
- Lundgren, D.L., Mauderly, J.L., Rebar, A.H., Gillett, N.A. & Hahn, F.F. (1991) Modifying effects of preexisting pulmonary fibrosis on biological responses of rats to inhaled  $^{239}\text{PuO}_2$ . *Health Phys.*, **60**, 353–363
- Lundgren, D.L., Hahn, F.F., Diel, J.H. & Snipes, M.B. (1992a) Repeated inhalation exposure of rats to aerosols of  $^{144}\text{CeO}_2$ . I. Lung, liver, and skeletal dosimetry. *Radiat. Res.*, **132**, 312–324
- Lundgren, D.L., Hahn, F.F. & Diel, J.H. (1992b) Repeated inhalation exposure of rats to aerosols of  $^{144}\text{CeO}_2$ . II. Effects on survival and lung, liver, and skeletal neoplasms. *Radiat. Res.*, **132**, 325–333

- Lundgren, D.L., Haley, P.J., Hahn, F.F., Diel, J.H., Griffith, W.C. & Scott, B.R. (1995) Pulmonary carcinogenicity of repeated inhalation exposure of rats to aerosols of  $^{239}\text{PuO}_2$ . *Radiat. Res.*, **142**, 39–53
- Lundgren, D.L., Hahn, F.F., Griffith, W.C., Hubbs, A.F., Nikula, K.J., Newton, G.J., Cuddihy, R.G. & Boecker, B.B. (1996) Pulmonary carcinogenicity of relatively low doses of beta-particle radiation from inhaled  $^{144}\text{CeO}_2$  in rats. *Radiat. Res.*, **146**, 525–535
- Lundgren, D.L., Hahn, F.F., Carlton, W.W., Griffith, W.C., Guilmette, R.A. & Gillett, N.A. (1997) Dose responses from inhaled monodisperse aerosols of  $^{244}\text{Cm}_2\text{O}_3$  in the lung, liver and skeleton of F344 rats and comparison with  $^{239}\text{PuO}_2$ . *Radiat. Res.*, **147**, 598–612
- Lüning, K.G., Frölén, H. & Nilsson, A. (1976) Genetic effects of  $^{239}\text{Pu}$  salt injections in male mice. *Mutat. Res.*, **34**, 539–542
- Luz, A., Müller, W.A., Gössner, W. & Hug, O. (1979) Osteosarcoma induced by short-lived bone-seeking  $\alpha$  emitters in mice: The role of age. *Environ. Res.*, **18**, 115–119
- Luz, A., Erfle, V., De Fries, E., Linzner, U., Müller, W.A., Kellerer, A.M. & Gössner, W. (1982) Comparison of osteosarcoma induction in female mice of three different strains. *Verh. Dtsch. Krebs Ges.*, **3**, 483
- Luz, A., Gössner, W. & Heuck, F. (1991) Bone. In: Scherer, E., Streffer, C. & Trott, K.-R., eds, *Radiopathology of Organs and Tissues*, Berlin, Springer-Verlag, pp. 67–111
- Mahaffey, J.A., Parkhurst, M.A., Hui, T.E., Brownson, R.C. & Alavanja, M.C.R. (1996) Factors affecting use of CR-39 surface monitor technology to estimate past exposure to indoor radon. *J. Exposure Anal. Environ. Epidemiol.*, **6**, 425–437
- Mahlum, D.D. & Clarke, W.J. (1966) Neptunium-237 toxicity in the rat. I. Histopathologic and chemical observations in liver and kidney. *Health Phys.*, **12**, 7–13
- Mahlum, D.D. & Sikov, M.R. (1968) Distribution of cerium-144 in the fetal and newborn rat. *Health Phys.*, **14**, 127–129
- Mahlum, D.D. & Sikov, M.R. (1969) Skeletal changes produced by the administration of plutonium-239 and cerium-144 to weanling rats. In: Sikov, M.R. & Mahlum, D.D., eds, *Radiation Biology of the Fetal and Juvenile Mammal* (CONF-690501), Springfield, VA, National Technical Information Service, pp. 567–576
- Mahlum, D.D. & Sikov, M.R. (1974) Distribution and toxicity of monomeric and polymeric  $^{239}\text{Pu}$  in immature and adult rats. *Radiat. Res.*, **60**, 75–88
- Maisin, J., Maisin, J.R. & Dunjic, A. (1971) The gastrointestinal tract. In: Berdjis, C.C., ed., *Pathology of Irradiation*, Baltimore, MD, William & Wilkins, pp. 296–344
- Maletskos, C.J., Keane, A.T., Telles, N.C. & Evans, R.D. (1969) Retention and absorption of  $^{224}\text{Ra}$  and  $^{234}\text{Th}$  and some dosimetric considerations of  $^{224}\text{Ra}$  in human beings. In: Mays, C.W., Jee, W.S.S., Lloyd, R.D., Stover, B.J., Dougherty, J.H. & Taylor, G.N., eds, *Delayed Effects of Bone-seeking Radionuclides*, Salt Lake City, University of Utah Press, pp. 29–49
- Malhotra, N. & Srivastava, P.N. (1978) Haematological effects after administration of radiophosphorus in mice: Fractionated irradiation and late effects. *Radiobiol. Radiother.*, **3**, 347–352
- Marsh, J.W. & Birchall, A. (2000) Sensitivity analysis of the weighted equivalent lung dose per unit exposure from radon progeny. *Radiat. Prot. Dosim.*, **87**, 167–178
- Martland, H.S. (1926) Macroscopic changes in certain anemias due to radioactivity. *Arch. Pathol. Lab. Med.*, **2**, 465–472

- Martland, H.S. (1931) The occurrence of malignancy in radioactive persons. *Am. J. Cancer*, **15**, 2435–2516
- Martland, H.S. & Martland, H.S., Jr (1950) Placental barrier in carbon monoxide, barbiturate and radium poisoning: Some original observations in humans. *Am. J. Surg.*, **80**, 270–279
- Martland, H.S., Conlon, P. & Knef, J.P. (1925) Some unrecognized dangers in the use and handling of radioactive substances. *J. Am. med. Assoc.*, **85**, 1769–1776
- Martling, U., Mattsson, A., Travis, L.B., Holm, L.-E. & Hall, P. (1999) Mortality after long-term exposure to radioactive Thorotrast: A forty-year follow-up survey in Sweden. *Radiat. Res.*, **151**, 293–299
- Mason, T.M., Lord, B.I., Molineux, G. & Humphries, E.R. (1992) Alpha-irradiation of haemopoietic tissues in pre- and postnatal mice. 2. Effects of mid-term contamination with  $^{239}\text{Pu}$  *in utero*. *Int. J. Radiat. Biol.*, **61**, 393–403
- Matsuda, Y., Yamada, T. & Tobari, I. (1986) Chromosome aberrations induced by tritiated water or  $^{60}\text{Co}$   $\gamma$ -rays at early pronuclear stage in mouse eggs. *Mutat. Res.*, **160**, 87–93
- Mauderly, J.L., Muggenburg, B.A., Hahn, F.F. & Boecker, B.B. (1980) The effects of inhaled  $^{144}\text{Ce}$  on cardiopulmonary function and histopathology of the dog. *Radiat. Res.*, **84**, 307–324
- Maurer, W., Niklas, A. & Engels, A. (1950) [Permeability of the placenta for thorium ions at different stages of gestation in the rat.] *Z. ges. exp. Med.*, **115**, 510–524 (in German)
- Mays, C.W. (1973) Cancer induction in man from internal radioactivity. *Health Phys.*, **25**, 585–592
- Mays, C.W. (1982) Risk estimates for liver. In: *Critical Issues in Setting Radiation Dose Limits. Proceedings of the 17th Annual Meeting of the National Council on Radiation Protection and Measurements 8–9 April 1981*, Washington DC, National Council on Radiation Protection and Measurements, pp. 182–200
- Mays, C.W. (1988) Alpha-particle-induced cancer in humans. *Health Phys.*, **55**, 637–652
- Mays, C.W. & Finkel, M.P. (1980) RBE of  $\alpha$ -particles vs  $\beta$ -particles in bone sarcoma induction. In: *Proceedings of the 5th International Congress of IRPA*, Jerusalem, Israel Society for Radiation Protection, Vol. II, pp. 661–665
- Mays, C.W. & Lloyd, R.D. (1966)  $^{90}\text{Sr}$  and  $^{89}\text{Sr}$  dose estimates for the fetus and infant. *Health Phys.*, **12**, 1225–1236
- Mays, C.W., Lloyd, R.D., Taylor, G.N. & Wrenn, M.E. (1987) Cancer incidence and lifespan vs.  $\alpha$ -particle dose in beagles. *Health Phys.*, **52**, 617–624
- Mayya, Y.S., Prasad, S.K., Nambiar, V.J., Kotrappa, P. & Somasundaram, S. (1986) Measurement of  $^{220}\text{Rn}$  in exhaled breath of Th plant workers. *Health Phys.*, **51**, 737–744
- McClellan, R.O. & Bustad, L.K. (1964) Toxicity of significant radionuclides in large animals. *Ann. N.Y. Acad. Sci.*, **111**, 793–811
- McClellan, R.O., McKenney, J.R. & Bustad, L.K. (1962) Dosimetry of caesium-137 in sheep. *Nature*, **194**, 1145–1146
- McClellan, R.O., Barnes, J.E., Boecker, B.B., Chiffelle, T.L., Hobbs, C.H., Jones, R.K., Mauderley, J.L., Pickrell, J.A. & Redman, H.C. (1970) Toxicity of beta-emitting radionuclides inhaled in fused clay particles — An experimental approach. In: Nettesheim, P., Hanna, M.J., Jr & Deatherage, J.W., eds, *Morphology of Experimental Respiratory Carcinogenesis* (AEC Symposium Series 21; CONF-700501), Oak Ridge, TN, Technical Information Services, pp. 395–415

- McCurney, R.J., Masse, F. & Galanek, M. (1999) Occupational ingestion of P-32: The value of monitoring techniques to determine dose. *J. occup. environ. Med.*, **41**, 878–883
- McDevitt, M.R., Sgouros, G., Finn, R.D., Humm, J.L., Jurcic, J.G., Larson, S.M. & Scheinberg, D.A. (1998) Radioimmunotherapy with alpha-emitting nuclides. *Eur. J. nucl. Med.*, **25**, 1341–1351
- McInroy, J.F., Kathren, R.L., Voelz, G.L. & Swint, M.J. (1991) US Transuranium Registry report on the <sup>239</sup>Pu distribution in a human body. *Health Phys.*, **60**, 307–333
- McInroy, J.F., Gonzales, E.R. & Miglio, J.J. (1992) Measurements of thorium isotopes and <sup>222</sup>Ra in soft tissues and bones of a deceased Thorotrast patient. *Health Phys.*, **63**, 54–71
- McKay, H.A.C. (1971) *Principles of Radiochemistry*, London, Butterworths, pp. 118–120
- Melo, D.R., Lipsztein, J.L., Oliveira, C.A., Lundgren, D.L., Muggenburg, B.A. & Guilmette, R.A. (1997) A biokinetic model for 137Cs. *Health Phys.*, **73**, 320–332
- Métivier, H., Masse, R., Nolibé, D. & Lafuma, J. (1975) <sup>239</sup>PuO<sub>2</sub> aerosol inhalation with emphasis on pulmonary connective tissue modifications. *Inhaled Part.*, **4**, 583–595
- Métivier, H., Masse, R., Legendre, N. & Lafuma, J. (1978) Pulmonary connective tissue modifications induced by internal α irradiation. 1. Effect of time and dose on alterations following inhalation of plutonium-239 dioxide aerosol in rat. *Radiat. Res.*, **75**, 385–396
- Métivier, H., Wahrendorf, J. & Masse, R. (1984) Multiplicative effect of inhaled plutonium oxide and benzo(a)pyrene on lung carcinogenesis in rats. *Br. J. Cancer*, **50**, 215–221
- Métivier, H., Bourges, J., Fritsch, P., Nolibe, D. & Masse, R. (1986) Gastrointestinal absorption of neptunium in primates: Effect of ingested mass, diet, and fasting. *Radiat. Res.*, **106**, 190–200
- Metting, N.F., Palayoor, S.T., Macklis, R.M., Atcher, R.W., Liber, H.L. & Little, J.B. (1992) Induction of mutations by bismuth-212 α particles at two genetic loci in human B-lymphoblasts. *Radiat. Res.*, **132**, 339–345
- Méwissen, D.J., Rust, J.H., Haren, J. & Cluten, M.J. (1978) Assessment of dose-response relationship in carcinogenesis following low radiation dosage. In: *Late Biological Effects of Ionizing Radiation*, Vol. II (IAEA-SM-225/404), Vienna, International Atomic Energy Agency, pp. 291–313
- Méwissen, D.J., Ugarte, A.S. & Rust, J.H. (1984) [Hereditary intestinal tumour observed after irradiation of multiple generations of a male germinal cell line of C57BL/6 mice.] *C.R. Soc. Biol.*, **178**, 230–235 (in French)
- Méwissen, D.J., Rust, J.H. & Rust, J. (1987) [Comparative incidence of reticulo-endothelial tumours in C57BL mice after exposure to tritiated water.] *C.R. Soc. Biol.*, **181**, 439–444 (in French)
- Meyer, G.-J., Waters, S.L., Coenen, H.H., Luxen, A., Maziere, B. & Langström, B. (1995) PET radiopharmaceuticals in Europe: Current use and data relevant for the formulation of summaries of product characteristics (SPCs). *Eur. J. nucl. Med.*, **22**, 1420–1432
- Migunova, N.I., Moroz, G.S., Okladnikova, N.D., Tokarskaya, Z.B. & Khokhryakov, V.F. (1978) [Liver and spleen hemangiosarcomas in female workers of the plutonium plant.] *Bull. Radiat. Med.*, **4**, 67–72 (in Russian)
- Mill, A.J., Wells, J., Hall, S.C. & Butler, A. (1996) Micronucleus induction in human lymphocytes: Comparative effects of X-rays, alpha particles, beta particles and neutrons and implications for biological dosimetry. *Radiat. Res.*, **145**, 575–585

- Miller, S.C., Bruenger, F.W., Kuswik-Rabiega, G. & Lloyd, R.D. (1992) Decorporation of plutonium by oral administration of a partially lipophilic polyaminocarboxylic acid. *Health Phys.*, **63**, 195–197
- Miller, S.C., Bruenger, F.W., Kuswik-Rabiega, G., Liu, G. & Lloyd, R.D. (1993) Duration and dose-related effects of an orally administered, partially lipophilic polyaminocarboxylic acid on the decorporation of plutonium and americium. *J. Pharmacol. exp. Ther.*, **267**, 548–554
- Miller, R.C., Randers-Pehrson, G., Geard, C.R., Hall, E.J. & Brenner, D.J. (1999) The oncogenic transforming potential of the passage of single  $\alpha$  particles through mammalian cell nuclei. *Proc. natl Acad. Sci. USA*, **96**, 19–22
- Mitchel, R.E.J., Jackson, J.S. & Heinmiller, B. (1999) Inhaled uranium ore dust and lung cancer risk in rats. *Health Phys.*, **76**, 145–155
- M'Kacher, R., Schlumberger, M., Legal, J.D., Violot, D., Beron-Gaillard, N., Gaussem, A. & Parmentier, C. (1998) Biological dosimetry in thyroid cancer patients after repeated treatments with iodine-131. *J. nucl. Med.*, **39**, 825–829
- Modan, B. & Lilienfeld, A.M. (1965) Polycythemia vera and leukemia. The role of radiation treatment. A study of 1222 patients. *Medicine*, **44**, 305–344
- Modan, B., Padeh, B., Kallner, H., Akstein, E., Meytes, D., Czerniak, P., Ramot, B., Pinkhas, J. & Modan, M. (1970) Chromosomal aberrations in polycythemia vera. *Blood*, **35**, 28–38
- Moe, A.J. (1995) Placental amino acid transport. *Am. J. Physiol.*, **268**, C1321–C1331
- Moeller, D.W. (1996) Radiation sources: Consumer products. In: Hendec, W.R. & Edwards, F.M., eds, *Health Effects of Exposure to Low-level Ionizing Radiation*, Bristol, Institute of Physics, pp. 287–313
- Mohelská, H., Parízek, O., Hyncica, V. & Hartlová, E. (1988) Early endosteal bone response to incorporated plutonium-238 in mice. *J. Hyg. Epidemiol. Microbiol. Immunol.*, **32**, 7–16
- Mole, R.H. (1986) Leukaemia induction in man by radionuclides and some relevant experimental and human observations. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 1–13
- Mole, R.H. (1990) Radon and leukaemia (Letter to the Editor). *Lancet*, **335**, 1336
- Momeni, M.H., Williams, J.R., Jow, N. & Rosenblatt, L.S. (1976) Dose rates, dose and time effects of  $^{90}\text{Sr}$  +  $^{90}\text{Y}$  and  $^{226}\text{Ra}$  on beagle skeleton. *Health Phys.*, **30**, 381–390
- Moniz, E. (1932) [Anatomical, physiological and clinical aspects of cerebral arteriography — New Thorotrast technique.] *Rev. med. Suisse Romande*, **52**, 193–207 (in French)
- Monteiro Gil, O., Oliveira, N.G., Rodrigues, A.S., Laires, R., Ferreira, T.C., Limbert, E., Léonard, A., Gerber, G. & Rueff, J. (2000) Cytogenetic alterations and oxidative stress in thyroid cancer patients after iodine-131 therapy. *Mutagenesis*, **15**, 69–75
- Moolgavkar, S.H., Luebeck, E.G., Krewski, D. & Zielinski, J.M. (1993) Radon, cigarette smoke, and lung cancer: A re-analysis of the Colorado Plateau uranium miners' data. *Epidemiology*, **4**, 204–217
- Morgan, J.P., Pool, R.R. & Kirsh, I.E. (1983) Comparison of radiological changes in humans and beagles with skeletal deposits of radium. *Health Phys.*, **44** (Suppl. 1), 353–363
- Morgan, A., Holmes, A. & Pratley, F.W. (1990) Solubility in the rat lung of actinides associated with estuarine silt from West Cumbria. *J. Radiol. Prot.*, **10**, 135–142
- Morgan, A., Haines, J.W. & Harrison, J.D. (1991) The incorporation of plutonium by the embryo and fetus of rats and guinea pigs. *Int. J. Radiat. Biol.*, **59**, 1395–1413

- Morgan, W.F., Day, J.P., Kaplan, M.I., McGhee, E.M. & Limoli, C.L. (1996) Genomic instability induced by ionizing radiation. *Radiat. Res.*, **146**, 247–258
- Morgenstern, H. (1995) Ecologic studies in epidemiology: Concepts, principles, and methods. *Annu. Rev. public Health*, **16**, 61–81
- Mori, T., Kato, Y., Kumatori, T., Maruyama, T. & Hatakeyama, S. (1983) Epidemiological follow-up study of Japanese Thorotrast cases — 1980. *Health Phys.*, **44** (Suppl. 1), 261–272
- Mori, T., Kumatori, T., Hatakeyama, S., Irie, H., Mori, W., Fukutomi, K., Baba, K., Maruyama, T., Ueda, A., Iwata, S., Tamai, T. & Akita, Y. (1989) Current (1986) status of the Japanese follow-up study of the Thorotrast patients, and its relationships to the statistical analysis of the autopsy series. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology
- Mori, T., Kato, Y., Matsudaira, H., Akita, Y., Fukutomi, K., Hatakeyama, S., Tanooka, H., Marayama, T. & Kumatori, T. (1995) Recent results in the first series of the Japanese follow-up study of Thorotrast patients and their relationships with statistical analyses of autopsy series. In: van Kaick, G., Karaoglu, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 181–191
- Mori, T., Fukutomi, K., Kato, Y., Hatakeyama, S., Machinami, R., Tanooka, H., Ishikawa, Y. & Kumatori, T. (1999a) 1998 results of the first series of follow-up studies on Japanese Thorotrast patients and their relationships to an autopsy series. *Radiat. Res.*, **152**, S72–S80
- Mori, T., Kido, C., Fukutomi, K., Kato, Y., Hatakeyama, S., Machinami, R., Ishikawa, Y., Kumatori, T., Sasaki, F., Hirota, Y., Kiyosawa, K., Hayashi, S., Tanooka, H. & Sobue, T. (1999b) Summary of entire Japanese Thorotrast follow-up study: Updated 1998. *Radiat. Res.*, **152**, S84–S87
- Moroz, G.S. (1976) [Lung cancer in occupationally exposed persons.] *Bull. Radiat. Med.*, **2**, 12–18 (in Russian)
- Moroz, B.B. & Parfenov, Y.D. (1972) Metabolism and biological effects of polonium-210. In: *Atomic Energy Review*, Vienna, Internal Atomic Energy Agency, Vol. 10, pp. 175–232
- Morrison, H.I., Semenciw, R.M., Mao, Y. & Wigle, D.T. (1988) Cancer mortality among a group of fluorspar miners exposed to radon progeny. *Am. J. Epidemiol.*, **128**, 1266–1275
- Morrison, H.I., Villeneuve, P.J., Lubin, J.H. & Schaubel, D.E. (1998) Radon-progeny exposure and lung cancer risk in a cohort of Newfoundland fluorspar miners. *Radiat. Res.*, **150**, 58–65
- Moskalev, J.I., Buldakov, L.A., Lyaginskaya, A.M., Ovcharenko, E.P. & Egorova, T.M. (1969) Experimental study of radionuclide transfer through the placenta and their biological action on the fetus. In: Sikov, M.R. & Mahlum, D.D., eds, *Radiation Biology of the Fetal and Juvenile Mammal* (CONF-690501), Springfield, VA, National Technical Information Service, pp. 153–160
- Moskalev, Y.I., Lyaginskaya, A.M., Zalckin, G.A., Nisimov, P.G., Romanova, I.B. & Korneev, Y.Y. (1989) Carcinogenic effects in rat progeny exposed perinatally to radionuclides. In: Napalkov, N.P., Rice, J.M., Tomatis, L. & Yamasaki, H., eds, *Perinatal and Multigeneration Carcinogenesis* (IARC Scientific Publication No. 96), Lyon, IARCPress, pp. 403–419
- Mountford, P.J. (1997) Risk assessment of the nuclear medicine patient. *Br. J. Radiol.*, **70**, 671–684
- Muggenburg, B.A., Felicetti, S.A. & Silbaugh, S.A. (1977) Removal of inhaled radioactive particles by lung lavage — A review. *Health Phys.*, **33**, 213–220

- Muggenburg, B.A., Hahn, F.F., Griffith, W.C., Boecker, B.B. & Lloyd, R.D. (1995) The biological effects of  $^{224}\text{Ra}$  injected into dogs. In: van Kaick, G., Karaoglu, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium*, Singapore, World Scientific, pp. 299–305
- Muggenburg, B.A., Hahn, F.F., Griffith, W.C., Lloyd, R.D. & Boecker, B.B. (1996a) The biological effects of  $^{224}\text{Ra}$  injected into dogs. *Radiat. Res.*, **146**, 171–186
- Muggenburg, B.A., Guilmette, R.A., Mewhinney, J.A., Gillett, N.A., Mauderly, J.L., Griffith, W.C., Diel, J.H., Scott, B.R., Hahn, F.F. & Boecker, B.B. (1996b) Toxicity of inhaled plutonium dioxide in beagle dogs. *Radiat. Res.*, **145**, 361–381
- Muggenburg, B.A., Boecker, B.B., Hubbs, A.F., Hahn, F.F., Snipes, M.B., Diel, J.H., Newton, G.J. & Griffith, W.C. (1998) Toxicity of inhaled  $^{91}\text{YCl}_3$  in dogs. *Radiat. Res.*, **150**, 212–226
- Muirhead, C.R., Butland, B.K., Green, B.M.R. & Draper, G.J. (1991) Childhood leukaemia and natural radiation (Letter to the Editor). *Lancet*, **337**, 503–504
- Müller, T. (1968) On the clearance of Thorotrast, a dextrin stabilized colloid. *Acta pharmacol. toxicol.*, **26**, 491–500
- Müller, J. & Kusiak, R. (1989) Lung cancer risk in uranium miners. In: Harley, N.H., eds, *Radon, Proceedings of the Twenty-fourth Annual Meeting, 30–31 March, 1988*, Bethesda, MD, National Council on Radiation Protection and Measurements, pp. 12–29
- Müller, W.A., Gössner, W., Hug, O. & Luz, A. (1978) Late effects after incorporation of the short-lived alpha-emitters  $^{224}\text{Ra}$  and  $^{227}\text{Th}$  in mice. *Health Phys.*, **35**, 33–55
- Müller, W.A., Luz, A., Schäffer, E.H. & Gössner, W. (1983) The role of time-factor and RBE for the induction of osteosarcomas by incorporated short-lived bone-seekers. *Health Phys.*, **44** (Suppl. 1), 203–212
- Müller, W.-U., Streffer, C., Molls, M. & Glück, L. (1987) Radiotoxicities of [ $^3\text{H}$ ]thymidine and of [ $^3\text{H}$ ]arginine compared in mouse embryos *in vitro*. *Radiat. Res.*, **110**, 192–198
- Müller, W.A., Luz, A., Murray, A.B. & Linzner, U. (1990) Induction of lymphoma and osteosarcoma in mice by single and protracted low  $\alpha$  doses. *Health Phys.*, **59**, 305–310
- Murzina, L.D., Muksinova, K.N. & Sokhranich, A.L. (1988) [Disorders of hematopoiesis induced by plutonium-239 dioxide]. *Radiobiologiya*, **28**, 847–852 (in Russian)
- Mussalo-Rauhamaa, H., Jaakkola, T., Miettinen, J.K. & Laiho, K. (1984) Plutonium in Finnish Lapps — An estimate of the gastrointestinal absorption of plutonium by man based on a comparison of the plutonium content of Lapps and southern Finns. *Health Phys.*, **46**, 549–559
- Muth, H. (1989) History of the German Thorotrast studies. Motivation and development of the studies in relation to similar investigations in other countries. In: Taylor, D.M., Mays, C.M., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiation, pp. 93–97
- Muth, M., Rajewsky, B., Hantke, H.-J. & Aurand, K. (1960) The normal radium content and the Ra-226/Ca ratio of various foods, drinking water and different organs and tissues of the human body. *Health Phys.*, **2**, 239–245
- Nagasawa, H. & Little, J.B. (1992) Induction of sister chromatid exchanges by extremely low doses of  $\alpha$ -particles. *Cancer Res.*, **52**, 6394–6396
- Nagasawa, H. & Little, J.B. (1999) Unexpected sensitivity to the induction of mutations by very low doses of alpha-particle radiation: Evidence for a bystander effect. *Radiat. Res.*, **152**, 552–557

- Naharin, A., Lubin, E. & Feige, Y. (1969) Transfer of  $^{144}\text{Ce}$  to mouse embryos and offspring via placenta and lactation. *Health Phys.*, **17**, 717–722
- Naharin, A., Feige, Y., Lubin, E. & Sadeh, T. (1974) Internal deposition of ingested cerium in suckling mice. *Health Phys.*, **27**, 207–211
- Najean, Y., Deschamps, A., Dresch, C., Daniel, M.T., Rain, J.D. & Arrago, J.P. (1988) Acute leukemia and myelodysplasia in polycythemia vera. A clinical study with long-term follow-up. *Cancer*, **61**, 89–95
- Narra, V.R., Howell, R.W., Thank, K.H. & Rao, D.V. (1991) Radiotoxicity of  $^{125}\text{I}$ -iododeoxyuridine in pre-implantation mouse embryos. *Int. J. Radiat. Biol.*, **60**, 525–532
- Narra, V.R., Harapanhalli, R.S., Howell, R.W., Sastry, K.S.R. & Rao, D.V. (1994) Vitamins as radioprotectors *in vivo*. I. Protection by vitamin C against internal radionuclides in mouse testes: Implications to the mechanism of damage caused by the Auger effect. *Radiat. Res.*, **137**, 394–399
- National Academy of Sciences (1991) *Comparative Dosimetry of Radon in Mines and Homes*, Washington DC, National Academy Press
- National Cancer Institute (1997) *Estimated Exposures and Thyroid Doses Received by the American People from Iodine-131 in Fallout Following Nevada Atmospheric Nuclear Bomb Tests* (NIH Publication No. 97-4264), Bethesda, MD, US Department of Health and Human Services, National Institutes of Health
- National Council on Radiation Protection and Measurements (1977) *Protection of the Thyroid Gland in the Event of Releases of Radioiodine* (NCRP Report No. 55), Bethesda, MD
- National Council on Radiation Protection and Measurements (1979) *Tritium and Other Radio-nuclide Labelled Organic Compounds Incorporated in Genetic Material* (NCRP Report 63), Bethesda, MD
- National Council on Radiation Protection and Measurements (1985) *Induction of Thyroid Cancer by Ionizing Radiation. Recommendations of the National Council on Radiation Protection and Measurements* (NCRP Report No. 80), Bethesda, MD
- National Council on Radiation Protection and Measurements (1987a) *Ionizing Radiation Exposure of the Population of the United States* (NCRP Report No. 93), Bethesda, MD
- National Council on Radiation Protection and Measurements (1987b) *Genetic Effects from Internally Deposited Radionuclides* (NCRP Report 89), Bethesda, MD
- National Council on Radiation Protection and Measurements (1991) *Some Aspects of Strontium Radiobiology* (NCRP Report No. 110), Bethesda, MD
- National Council on Radiation Protection and Measurements (1998) *Radionuclide Exposure of the Embryo Fetus* (NCRP Report 128), Bethesda, MD
- National Radiological Protection Board (2000) *Health Risks from Radon*, Oxford
- National Research Council (1991) *Panel on Dosimetric Assumptions Affecting the Application of Radon Risk Estimates. Comparative Dosimetry of Radon in Mines and Homes*, Washington DC, National Academy Press
- Negri, E., Ron, E., Franceschi, S., Dal Maso, L., Mark, S.D., Preston-Martin, S., McTiernan, A., Kolonel, L., Kleinerman, R., Land, C., Jin, F., Wingren, G., Galanti, M.R., Hallquist, A., Glattre, E., Lund, E., Levi, F., Linos, D., Braga, C. & La Vecchia, C. (1999) A pooled analysis of case-control studies of thyroid cancer. I. Methods. *Cancer Causes Control*, **10**, 131–142

- Nekolla, E.A., Kellerer, A.M., Kuse-Isingschulte, M., Eder, E. & Spiess, H. (1999) Malignancies in patients treated with high doses of radium-224. *Radiat. Res.*, **152**, S3–S7
- Nekolla, E.A., Kreisheimer, M., Kellerer, A.M., Kuse-Isingschulte, M., Gössner, W. & Spiess, H. (2000) Induction of malignant bone tumors in radium-224 patients: Risk estimates based on the improved dosimetry. *Radiat. Res.*, **153**, 93–103
- Neton, J., Lo Sasso, T., Cohen, N. & Wrenn, M.E. (1979) *Cross-placental Transfer of <sup>243/244</sup>Cm in the Baboon* (COO-3382-18), New York, New York University, Institute of Environmental Medicine, pp. V1–V6
- Nikiforov, Y. & Gnepp, D.R. (1994) Pediatric thyroid cancer after the Chernobyl disaster. Pathomorphologic study of 84 cases (1991–1992) from the Republic of Belarus. *Cancer*, **74**, 748–766
- Nikipelov, B.V., Lizlov, A.F. & Koshurnikova, N.A. (1990) [The experience of the first nuclear enterprise (exposure levels and personnel health).] *Priroda*, **2**, 30–38 (in Russian)
- Nikolaevskaya, N.G., Sokhranich, A.L., Uriadnitskaia, T.I. & Muksinova, K.N. (1988) [Structural chromosomal damages in myelokaryocytes exposed to plutonium-239 dioxide.] *Radio-biologija*, **28**, 509–512 (in Russian)
- Nikula, K.J., Muggenburg, B.A., Chang, I.-Y., Griffith, W.C., Hahn, F.F. & Boecker, B.B. (1995) Biological effects of <sup>137</sup>CsCl injected in beagle dogs. *Radiat. Res.*, **142**, 347–361
- Nikula, K.J., Muggenburg, B.A., Griffith, W.C., Carlton, W.W., Fritz, T.E. & Boecker, B.B. (1996) Biological effects of <sup>137</sup>CsCl injected in beagle dogs of different ages. *Radiat. Res.*, **146**, 536–547
- Nilsson, A. (1970) Pathologic effects of different doses of radiostrontium in mice. Dose effect relationship in <sup>90</sup>Sr-induced bone tumours. *Acta radiol. ther. phys. biol.*, **9**, 155–176
- Nilsson, A. (1971) Radiostrontium-induced carcinomas of the external ear. *Acta radiol. ther. phys. biol.*, **10**, 321–328
- Nilsson, A. & Broomé-Karlsson, A. (1976) The pathology of americium-241. *Acta radiol. ther. phys. biol.*, **15**, 49–70
- Nilsson, A., Bierke, P., Walinder, G. & Broomé-Karlsson, A. (1980) Age and dose related carcinogenicity of <sup>90</sup>Sr. *Acta radiol. oncol.*, **19**, 223–228
- Nofal, M.M. & Beierwaltes, W.H. (1964) Persistent chromosomal aberrations following radioiodine therapy. *J. nucl. Med.*, **5**, 840–850
- Nolibo, D., Maase, R. & Lafuma, J. (1981) The effect of neonatal thymectomy on lung cancers induced by rats by plutonium dioxide. *Radiat. Res.*, **87**, 90–99
- Nussbaum, E. & Hursh, J.B. (1957) Rn-222 solubility in rat tissues. *Science*, **125**, 552–553
- Nusynowitz, M.L. (1999) Thyroid imaging. *Lippincott's prim. Care Pract.*, **3**, 546–555
- Ober, S., Bannasch, P. & Spiethoff, A., (1994) Precancerous hepatic lesions induced by fractionated neutron radiation and Thorotrast. In: van Kaick, G., Karaoglou, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides*, Singapore, World Scientific, pp. 365–368
- OECD (Organization for Economic Cooperation and Development) (1996) *Fourth Annual Report: Occupational Exposures at Nuclear Power Plants: 1969–1994*, Paris, Nuclear Energy Agency
- OECD (Organization for Economic Cooperation and Development) (1998) *Sixth Annual Report: Occupational Exposures at Nuclear Power Plants: 1986–1996*, Paris, Nuclear Energy Agency

- Oghiso, Y. & Yamada, Y. (1999) Carcinogenesis in mice after injection of soluble plutonium citrate. *Radiat. Res.*, **152**, S27–S30
- Oghiso, Y., Yamada, Y., Ishigure, N., Fukuda, S., Iida, H., Yamada, Y., Sato, H., Koizumi, A. & Inaba, J. (1994a) High incidence of malignant lung carcinomas in rats after inhalation of  $^{239}\text{PuO}_2$ . *J. Radiat. Res.*, **35**, 222–235
- Oghiso, Y., Yamada, Y. & Iida, H. (1994b) Differential induction of bone and hematopoietic tumors in C3H mice after the injection of  $^{239}\text{Pu}$  citrate. *J. Radiat. Res.*, **35**, 236–247
- Oghiso, Y., Yamada, Y. & Iida, H. (1997) High frequency of leukemic lymphomas with osteosarcomas but no myeloid leukaemias in C3H mice after  $^{239}\text{Pu}$  citrate injection. *J. Radiat. Res.*, **38**, 77–86
- Oghiso, Y., Yamada, Y., Iida, H. & Inaba, J. (1998) Differential dose responses of pulmonary tumour types in the rat after inhalation of plutonium dioxide aerosols. *J. Radiat. Res.*, **39**, 61–72
- Oka, M. (1930) [Clinical use of roentgenologic imagery, a new method for representation of spleen and liver ('splenography').] *Fortschr. geb. Röntgenstrahl.*, **41**, 892–898 (in German)
- Omar, R.Z., Barber, J.A. & Smith, P.G. (1999) Cancer mortality and morbidity among plutonium workers at the Sellafield plant of British Nuclear Fuels. *Br. J. Cancer*, **79**, 1288–1301
- O'Mara, R.E. (1976) Skeletal scanning in neoplastic disease. *Cancer*, **37**, 480–486
- Osechinsky, I.V., Martirosov, A.R., Proshin, A.D., Michailov, G.N., Miliutina, G.I., Singerman, B.V., Abramova, M.M., Shorin, D.U., Kobeliatsky, V.F., Abdulkadyrov, K.M. & Samuskevitch, I.G. (1994) [Epidemiological register of leukaemia and other hemoblastoses in Bryansk district as an instrument of investigation of consequences of Chernobyl accident]. *Gematol. Tranfuziol.*, **3**, 32–36 (in Russian)
- Osgood, E.E. (1964) Contrasting incidence of acute monocytic and granulocytic leukemias in  $^{32}\text{P}$  treated patients with polycythemia vera and chronic lymphocytic leukemia. *J. Lab. clin. Med.*, **64**, 560–573
- Otake, M. & Schull, W.J. (1990) Radiation-related posterior lenticular opacities in Hiroshima and Nagasaki atomic bomb survivors based on the DS86 dosimetry system. *Radiat. Res.*, **121**, 3–13
- Ovcharenko, E.P. & Fomina, T.P. (1982) [Effects of intravenous administration of  $^{237}\text{Np}$  oxalate on gonads of rats and on their progeny.] *Radiobiologija*, **22**, 374–378 (in Russian)
- Ovcharenko, E.P. & Fomina, T.P. (1983) [Combined effect of external  $\gamma$ -irradiation and intratracheal administration of  $^{239}\text{Pu}$  on the reproductive function of female rats and on their progeny.] *Radiobiologija*, **23**, 110–113 (in Russian)
- Pacchierotti, F., Andreozzi, U., Russo, A. & Metalli, P. (1983) Reciprocal translocations in ageing mice and in mice with long-term low-level  $^{239}\text{Pu}$  contamination. *Int. J. Radiat. Biol.*, **43**, 445–450
- Pacini, F., Vorontsova, T., Demidchik, E.P., Molinaro, E., Agate, L., Romei, C., Shavrova, E., Cherstvoy, E.D., Ivashkevitch, Y., Kuchinskaya, E., Schlumberger, M., Ronga, G., Filesi, M. & Pinchera, A. (1997) Post-Chernobyl thyroid carcinoma in Belarus children and adolescents: Comparison with naturally-occurring thyroid carcinoma in Italy and France. *J. clin. Endocrinol. Metab.*, **82**, 3563–3569

- Padovani, L., Caporossi, D., Tedeschi, B., Vernole, P., Nicoletti, B. & Mauro, F. (1993) Cytogenetic study in lymphocytes from children exposed to ionizing radiation after the Chernobyl accident. *Mutat. Res.*, **319**, 55–60
- Papke, K., Kellerer, A.M., Korber, D., Nekolla, E., Roedler-Vogelsang, T. & Spiess, H. (1995) Mammary carcinomas in patients treated with Rn-224. In: van Kaick, G., Karaoglou, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 249–254
- Paquet, F., Poncy, J.-L., Ham, G.J., Prosser, S.L. & Harrison, J.D. (1998) Transfer of polonium, neptunium, plutonium and americium to the primate fetus. *Radiat. Prot. Dosim.*, **79**, 303–306
- Parfenov, Y.D. & Poluboyarinova, Z.I. (1973) Polonium-210 metabolism in rabbits after a single intravenous and intratracheal injection. *Int. J. Radiat. Biol.*, **23**, 487–493
- Park, J.F., Lund, J.E., Ragan, H.A., Hackett, P.L. & Frazier, M.E. (1976) Bone tumours induced by inhalation of  $^{238}\text{PuO}_2$  in dogs. *Recent Results Cancer Res.*, **54**, 17–35
- Park, J.F., Buschbom, R.L., Dagle, G.E., James, A.C., Watson, C.R. & Weller, R.E. (1997) Biological effects of inhaled  $^{238}\text{PuO}_2$  in beagles. *Radiat. Res.*, **148**, 365–381
- Parr, R.M. (1968) The radioactivity of Thorotrast and its in vitro distribution between the various physical phases. In: *The Dosimetry and Toxicity of Thorotrast. IAEA Meeting Vienna, 4–7 October 1965* (IAEA Technical Report 106), Vienna, International Atomic Energy Agency, pp. 5–19
- Parshkov, E.M., Chebotareva, I.V., Sokolov, V.A. & Dallas, C.E. (1997) Additional thyroid dose factor from transportation sources in Russia after the Chernobyl disaster. *Environ. Health Perspectives*, **105** (Suppl. 6), 1491–1496
- Pauwels, E.K.J., Thomson, W.H., Blokland, J.A.K., Schmidt, M.E., Bourguignon, M., El-Maghrary, T.A.F., Broerse, J.J. & Harding, L.K. (1999) Aspects of fetal thyroid dose following iodine-131 administration during early stages of pregnancy in patients suffering from benign thyroid disorders. *Eur. J. nucl. Med.*, **26**, 1453–1457
- Percy, C. & Sabin, L. (1983) Surveillance, epidemiology, and end results lung cancer data applied to the World Health Organization's classifications of lung tumors. *J. natl Cancer Inst.*, **70**, 663–666
- Pershagen, G., Liang, Z.-H., Hrubec, Z., Svensson, C. & Boice, J.D., Jr (1992) Residential radon exposure and lung cancer in Swedish women. *Health Phys.*, **63**, 179–186
- Pershagen, G., Åkerblom, G., Axelson, O., Clavensjö, B., Damberg, L., Desai, G., Enflo, A., Lagarde, F., Mellander, H., Svartengren, M. & Swedjemark, G.A. (1994) Residential radon exposure and lung cancer in Sweden. *New Engl. J. Med.*, **330**, 159–164
- Pesternikov, V.M., Nifatov, A.P. & Surov, A.I. (1972) [Time of possible occurrence of bone tumors in human exposed to plutonium-239 (preliminary communication).] *Bull. Radiat. Med.*, **2**, 24–28 (in Russian)
- Peterson, L.E., Zhumadilov, Z.S., Kripalani, S., Progulov, Y.V., Wheeler, T.M., Gusev, B.I., Arem, R., Yonov, S. & Weinberg, A.D. (1998) Diagnosis of benign and malignant thyroid disease in the East Kazakhstan region of the Republic of Kazakhstan: A case review of pathological findings for 2525 patients. *Cancer Res. Ther. Control.*, **5**, 307–312
- Peto, J. (1990) Radon and the risks of cancer. *Nature*, **345**, 389–390
- Piantadosi, S. (1994) Invited commentary: Ecologic biases. *Am. J. Epidemiol.*, **139**, 761–764

- Pickrell, J.A., Diel, J.H., Slauson, D.O., Halliwell, W.H. & Mauderly, J.L. (1983) Radiation-induced pulmonary fibrosis resolves spontaneously if dense scars are not formed. *Exp. mol. Pathol.*, **38**, 22–32
- Pietrzak-Flis, Z., Radwan, I., Major, Z. & Kowalska, M. (1982) Tritium incorporation in rats chronically exposed to tritiated food or tritiated water for three successive generations. *J. Radiat. Res.*, **22**, 434–442
- Pinel, J., Fearn, T., Darby, S.C. & Miles, J.C.H. (1995) Seasonal correction factors for indoor radon measurements in the United Kingdom. *Radiat. Protect. Dosim.*, **58**, 127–132
- Plotnikova, L.A. (1965) [Biodistribution of  $^{239}\text{Pu}$ .] *Bull. Radiat. Med.*, **1**, 9–16 (in Russian)
- Pochin, E.E. (1983) *Sizewell B Inquiry. The Biological Bases of the Assumptions Made by NRPB in the Calculation of Health Effects. Proof of Evidence* (NRPB/P/2 (rev.) and NRPB/P/2 (rev.)/Add. 1), Chilton, National Radiological Protection Board
- Polednak, A.P. (1980) Fertility of women after exposure to internal and external radiation. *J. environ. Pathol. Toxicol.*, **4**, 457–470
- Polednak, A.P. & Frome, E.L. (1981) Mortality among men employed between 1943 and 1947 at a uranium-processing plant. *J. occup. Med.*, **23**, 169–178
- Polednak, A.P., Stehney, A.F. & Lucas H.F. (1983) Mortality among male workers at a thorium-processing plant. *Health Phys.*, **44** (Suppl. 1), 239–251
- Pomerantseva, M.D., Ramaiya, L.K., Vilkina, G.A., Shevchenko, V.A., Vasilenko, I.J., Lyaginskaya, A.M. & Istomina, A.G. (1983) Genetic effects of radiocarbon in reproductive cells of male mice. *Mutat. Res.*, **122**, 341–346
- Pomerantseva, M.D., Ramaiya, L.K., Shevchenko, V.A., Vilkina, G.A., Lyaginskaya, A.M. & Dementiev, S.I. (1987a) [Induction of genetic damage by  $^{238}\text{Pu}$  incorporated by germ cells of male mice.] *Radiobiologija*, **27**, 206–211 (in Russian)
- Pomerantseva, M.D., Shevchenko, V.A., Ramaiya, L.K., Vilkina, G.A., Lyaginskaya, A.M. & Goloshchapov P.V. (1987b) [The cytogenetic effect of  $^{238}\text{Pu}$ - $\alpha$ -radiation on germ cells of male mice.] *Radiobiologija*, **27**, 344–348 (in Russian)
- Pomerantseva, M.D., Ramaiya, L.K., Shevchenko, V.A., Vilkina, G.A. & Lyaginskaya, A.M. (1988) [Evaluation of genetic consequences of incorporation of  $^{238}\text{Pu}$  into the mammalian organism.] *Genetika*, **29**, 671–681 (in Russian)
- Pool, R.R., Morgan, J.P., Parks, N.J., Farnham, J.E. & Littman, M.S. (1983) Comparative pathogenesis of radium-induced intracortical bone lesions in humans and beagles. *Health Phys.*, **44** (Suppl. 1), 155–177
- Popp, W., Vahrenholz, C., Schuster, H., Wiesner, B., Bauer, P., Täuscher, F., Plogmann, H., Morgenroth, K., Konietzko, N. & Norpoth, K. (1999) *p53* mutations and codon 213 polymorphism of *p53* in lung cancers of former uranium miners. *J. Cancer Res. Clin. Oncol.*, **125**, 309–312
- Popplewell, D.S., Harrison, J.D. & Ham, G.J. (1991) Gastrointestinal absorption of neptunium and curium in humans. *Health Phys.*, **60**, 797–805
- Popplewell, D.S., Ham, G.J., McCarthy, W. & Lands, C. (1994) Transfer of plutonium across the human gut and its urinary excretion. *Radiat. Prot. Dosim.*, **53**, 241–244
- Prabhavathi, P.A., Fatima, S.K., Padmavathi, P., Kumari, C.K. & Reddy, P.P. (1995) Sister-chromatid exchanges in nuclear fuel workers. *Mutat. Res.*, **347**, 31–35

- Prabhavathi, P.A., Fatima, S.K., Rao, M.S. & Reddy, P.P. (2000) Analysis of chromosomal aberration frequencies in the peripheral blood lymphocytes of smokers exposed to uranyl compounds. *Mutat. Res.*, **466**, 37–41
- Preston, D.L., Kusumi, S., Tomonaga, M., Izumi, S., Ron, E., Kuramoto, A., Kamada, N., Dohy, H., Matsuo, T., Nonaka, H., Thompson, D.E., Soda, M. & Mabuchi, K. (1994) Cancer incidence in atomic bomb survivors. Part III. Leukemia, lymphoma, and multiple myeloma 1950–1987. *Radiat. Res.*, **137**, S68–S97
- Priest, N.D. (1990) The distribution and behaviour of heavy metals in the skeleton and body: Studies with bone-seeking radionuclides. In: Priest, N.D. & Van de Vyver, F.L., eds, *Trace Metals and Fluoride in Bones and Teeth*, Boca Raton, FL, CRC Press, pp. 83–139
- Priest, N.D., Newton, D., Day, J.P., Talbot, R.J. & Warner, A.J. (1995a) Human metabolism of aluminium-26 and gallium-67 injected as citrates. *Hum. exp. Toxicol.*, **14**, 287–293
- Priest, N.D., Freemont, A., Humphreys, J.A.H. & Kathren, R.L. (1995b) Histopathology and  $^{241}\text{Am}$  microdistribution in skeletal USTUR Case 246. *Health Phys.*, **69**, 330–337
- Prise, K.M., Davies, S. & Michael, B.D. (1987) The relationship between radiation-induced DNA double-strand breaks and cell kill in hamster V79 fibroblasts irradiated with 250 kVp X-rays, 2.3 MeV neutrons or  $^{238}\text{Pu}$  alpha-particles. *Int. J. Radiat. Biol.*, **52**, 893–902
- Prise, K.M., Folkard, M., Davies, S. & Michael, B.D. (1989) Measurement of DNA damage and cell killing in Chinese hamster V79 cells irradiated with aluminum characteristic ultrasoft X-rays. *Radiat. Res.*, **117**, 489–499
- Prisyazhniuk, A., Pjatak, O.A., Buzanov, V.A., Reeves, G.K. & Beral, V. (1991) Cancer in the Ukraine, post-Chernobyl (Letter to the Editor). *Lancet*, **338**, 1334–1335
- Prisyazhniuk, A., Gristchenko, V., Zakordonets, V., Fouzik, N., Slipeniuk, Y. & Ryzhak, I. (1995) The time trends of cancer incidence in the most contaminated regions of the Ukraine before and after the Chernobyl accident. *Radiat. environ. Biophys.*, **34**, 3–6
- Prisyazhniuk, A., Fedorenko, Z., Okeanov, A., Ivanov, V., Starinsky, V., Gristchenko, V. & Remennik, L. (1996) Epidemiology of cancer in population living in contaminated territories of Ukraine, Belarus, Russia after the Chernobyl accident. In: Karaoglu, A., Desmet, G., Kelly, G.N. & Menzel, H.G., eds, *The Radiological Consequences of the Chernobyl Accident. Proceedings of the First International Conference, Minsk, Belarus, 18 to 22 March 1996* (EUR 16544 EN), Luxembourg, Office for Official Publications of the European Communities, pp. 909–921
- Prosser, J.S., Izard, B.E., Brown, J.K., Hetherington, E.L., Lambrecht, R.M., Cato, L., Wallace, M., Whitwell, J., Wiseman, J. & Hoschl, R. (1993) Induction of micronuclei in peripheral blood lymphocytes of patients treated for rheumatoid or osteo-arthritis of the knee with dysprosium-165 hydroxide macroaggregates or yttrium-90 silicate. *Cytobios*, **73**, 7–15
- Prosser, S.L., McCarthy, W.M. & Lands, C. (1994) The plutonium content of human fetal tissue and implications for fetal dose. *Radiat. Prot. Dosim.*, **55**, 49–55
- Przygodzki, R.M., Finkelstein, S.D., Keohavong, P., Zhu, D., Bakker, A., Swalsky, P.A., Soini, Y., Ishak, K.G. & Bennett, W.P. (1997) Sporadic and thorotrust-induced angiosarcomas of the liver manifest frequent and multiple point mutations in K-ras-2. *Lab. Invest.*, **76**, 153–159
- Purrott, R.J., Edwards, A.A., Lloyd, D.C. & Stather, J.W. (1980) The induction of chromosome aberrations in human lymphocytes by *in vitro* irradiation with  $\alpha$ -particles from plutonium-239. *Int. J. Radiat. Biol.*, **38**, 277–284

- Qiao, Y.-L., Taylor, P.R., Yao, S.-X., Schatzkin, A., Mao, B.-L., Lubin, J., Rao, J.-Y., McAdams, M., Xuan, X.-Z. & Li, J.-Y. (1989) Relation of radon exposure and tobacco use to lung cancer among tin miners in Yunnan province, China. *Am. J. Ind. Med.*, **16**, 511–521
- Raabe, O.G., Parks, N.J. & Book, S.A. (1981) Dose-response relationships for bone tumours in beagles exposed to  $^{226}\text{Ra}$  and  $^{90}\text{Sr}$ . *Health Phys.*, **40**, 863–880
- Raabe, O.G., Book, S.A. & Parks, N.J. (1983) Lifetime bone cancer dose-response relationships in beagles and people from skeletal burdens of  $^{226}\text{Ra}$  and  $^{90}\text{Sr}$ . *Health Phys.*, **44** (Suppl. 1), 33–48
- Radford, E.P., Jr & Hunt, V.R. (1964) Polonium-210: A volatile radioelement in cigarettes. *Science*, **143**, 247–249
- Radford, E.P. & St Clair Renard, K.G. (1984) Lung cancer in Swedish iron miners exposed to low doses of radon daughters. *New Engl. J. Med.*, **310**, 1485–1494
- Radt, P. (1930) [A new method for roentgenologic imagery of liver and spleen by injection of a contrast medium (hepato-splenography).] *Med. Klin.*, **51**, 1888–1891 (in German)
- Rajewsky, B., Bellocch-Zimmermann, V., Löhr, E. & Stahlhofen, W. (1965)  $^{226}\text{Ra}$  in human embryonic tissue, relationship of activity to the stage of pregnancy, measurement of natural  $^{226}\text{Ra}$  occurrence in the human placenta. *Health Phys.*, **11**, 161–169
- Raju, M.R., Carpenter, S.G., Chmielewski, J.J., Schillaci, M.E., Wilder, M.E., Freyer, J.P., Johnson, N.F., Schor, P.L. & Sebring, R.J. (1987) Radiobiology of ultrasoft X rays. *Radiat. Res.*, **110**, 396–412
- Rallison, M.L., Dobyns, B.M., Keating, F.R., Rall, J.E. & Tyler, F.H. (1974) Thyroid disease in children. A survey of subjects potentially exposed to fallout radiation. *Am. J. Med.*, **56**, 457–463
- Rallison, M.L., Lotz, T.M., Bishop, M., Divine, W., Haywood, K., Lyon, J.L. & Stevens, W. (1990) Cohort study of thyroid disease near the Nevada Test Site: A preliminary report. *Health Phys.*, **59**, 739–746
- Rathke, F.W. (1954) [Early and late damage after treatment with Peteosthor]. *Münch. med. Wschr.*, **96**, 884–886 (in German)
- Reincke, U., Burlington, H., Cronkite, E.P., Hillman, M & Laissue, J. (1975) Selective damage to erythroblasts by  $^{55}\text{Fe}$ . *Blood*, **45**, 801–810
- Reist, C.J., Foulon, C.F., Alston, K., Bigner, D.D. & Zalutsky, M.R. (1999) Astatine-211 labeling of internalizing anti-EGFRvIII monoclonal antibody using N-succinimidyl-5-[211At]astato-3-pyridinecarboxylate. *Nucl. Med. Biol.*, **26**, 405–411
- Rencova, J., Volf, V., Jones, M.M. & Singh, P.K. (1993) Relative effectiveness of dithiol and dithiocarbamate chelating agents in reducing retention of polonium-210 in rats. *Int. J. Radiat. Biol.*, **63**, 223–232
- Rencova, J., Volf, V., Jones, M.M., Singh, P.K. & Filgas, R. (1995) Bis-dithiocarbamates: Effective chelating agents for mobilization of polonium-210 from rat. *Int. J. Radiat. Biol.*, **67**, 229–234
- Reyes, M., Wilkinson, G.S., Tietjen, G., Voelz, G.L., Acquavella, M.S. & Bistline, R. (1984) Brain tumors at a nuclear facility. *J. Occup. Med.*, **26**, 721–724
- Riches, A.C., Herceg, Z., Bryant, P.E., Stevens, D.L. & Goodhead, D.T. (1997) Radiation-induced transformation of SV40-immortalized human thyroid epithelial cells by single exposure to plutonium  $\alpha$ -particles *in vitro*. *Int. J. Radiat. Biol.*, **72**, 515–521

- Richter, H.E., Lohrer, H.D., Hieber, L., Kellerer, A.M., Lengfelder, E. & Bauchinger, M. (1999) Microsatellite instability and loss of heterozygosity in radiation-associated thyroid carcinomas of Belarusian children and adults. *Carcinogenesis*, **20**, 2247–2251
- Riddell, A.E., Battersby, W.P., Peace, M.S. & Strong, R. (2000) The assessment of organ doses from plutonium for an epidemiological study of the Sellafield workforce. *J. Radiol. Protect.*, **20**, 275–286
- Rigo, P., Paulus, P., Kaschten, B.J., Hustinx, R., Bury, T., Jerusalem, G., Benoit, T. & Foidart-Willems, J. (1996) Oncological applications of positron emission tomography with fluorine-18 fluorodeoxyglucose. *Eur. J. nucl. Med.*, **23**, 1641–1674
- Ritz, B. (1999) Radiation exposure and cancer mortality in uranium processing workers. *Epidemiology*, **10**, 531–538
- Rivera, J. (1963) Strontium–calcium discrimination by the human placenta. *Nature*, **200**, 269–270
- Robbins, J. & Adams, W.H. (1989) Radiation effects in the Marshall Islands. In: Nagataki, S., ed., *Radiation and the Thyroid, Proceedings of The 27th Annual Meeting of the Japanese Nuclear Medicine Society, Nagasaki, October 1–3, 1987*, Amsterdam, Excerpta Medica, pp. 11–24
- Robertson, J.B., Koehler, A., George, J. & Little, J.B. (1983) Oncogenic transformation of mouse BALB/3T3 cells by plutonium-238 alpha particles. *Radiat. Res.*, **96**, 261–274
- Robins, M.W. (1990)  $^{224}\text{Ra}$ -induced osteopenia in male CBA mice. *Calcif. Tiss. int.*, **46**, 94–100
- Rochalska, M. & Szot, Z. (1977) The incorporation of organically-bound tritium of food into some organs of the rat. *Int. J. Radiat. Biol.*, **31**, 391–395
- Roedler, H.D. (1987) Assessment of fetal activity concentration and fetal dose for selected radionuclides based on animal and human data. In: Gerber, G.B., Métivier, H. & Smith, H., eds, *Age-related Factors in Radionuclide Metabolism and Dosimetry*, Dordrecht, Martinus Nijhoff, pp. 327–337
- Ron, E., Lubin, J.H., Shore, R.E., Mabuchi, K., Modan, B., Pottern, L.M., Schneider, A.B., Tucker, M.A. & Boice, J.D., Jr (1995) Thyroid cancer after exposure to external radiation: A pooled analysis of seven studies. *Radiat. Res.*, **141**, 259–277
- Ron, E., Doody, M.M., Becker, D.V., Brill, A.B., Curtis, R.E., Goldman, M.B., Harris, B.S.H., III, Hoffman, D.A., McConahey, W.M., Maxon, H.R., Preston-Martin, S., Warshauer, M.E., Wong, L., Boice, J.D., Jr for the Cooperative Thyrotoxicosis Therapy Follow-up Study Group (1998) Cancer mortality following treatment for adult hyperthyroidism. *J. Am. med. Assoc.*, **280**, 347–355
- Rönnbäck, C. (1979) Effect of  $^{90}\text{Sr}$  on ovaries of foetal mice depending on time for administration during pregnancy. *Acta radiol. oncol.*, **18**, 225–234
- Rönnbäck, C. (1981a) Influence of  $^{90}\text{Sr}$ -contaminated milk on the ovaries of foetal and young mice. *Acta radiol. oncol.*, **20**, 131–135
- Rönnbäck, C. (1981b) Disturbances of fertility in female mice  $^{90}\text{Sr}$ -contaminated as foetuses. *Acta radiol. oncol.*, **20**, 337–343
- Rönnbäck, C. & Nilsson, A. (1982) Neoplasms in ovaries of CBA mice  $^{90}\text{Sr}$ -treated as foetuses. *Acta radiol. oncol.*, **21**, 121–128
- Rönnbäck, C., Henricson, B. & Nilsson (1971) Effect of different doses of  $^{90}\text{Sr}$  on ovaries of the foetal mouse. *Acta radiol., Suppl.* **310**, 200–209

- Rooney, C., Beral, V., Maconochie, N., Fraser, P. & Davies, G. (1993) Case-control study of prostatic cancer in employees of the United Kingdom Atomic Energy Authority. *Br. med. J.*, **307**, 1391-1397
- Roscoe, R.J. (1997) An update of mortality from all causes among white uranium miners from the Colorado Plateau study group. *Am. J. ind. Med.*, **31**, 211-222
- Roscoe, R.J., Steenland, K., Halperin, W.E., Beaumont, J.J. & Waxweiler, R.J. (1989) Lung cancer mortality among nonsmoking uranium miners exposed to radon daughters. *J. Am. med. Assoc.*, **262**, 629-633
- Roscoe, R.J., Deddens, J.A., Salvan, A. & Schnorr, T.M. (1995) Mortality among Navajo uranium miners. *Am. J. public Health*, **85**, 535-540
- Rosemann, M., Milner, A. & Lambert, B.E. (1999) Chromosomal instability in haemopoietic cells of the foetus, mother and offspring after *in utero* irradiation of the CBA/Ca mouse. *Int. J. Radiat. Biol.*, **75**, 601-607
- Rowland, R.E. (1994) *Radium in Humans: A Review of US Studies* (Report ANL/ER-3), Argonne, IL, Argonne National Laboratory.
- Rowland, R.E. (1997) Bone sarcoma in humans induced by radium: A threshold response? *Radioprotection*, **32**, C1-331-C1-338
- Rowland, R.E. & Marshall, J.H. (1959) Radium in human bone: The dose in microscopic volumes of bone. *Radiat. Res.*, **11**, 299-313
- Rowland, R.E., Stehney, A.F., Brues, A.M., Littman, M.S., Keane, A.T., Patten, B.C. & Shanahan, M.M. (1978a) Current status of the study of  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  in humans at the Center for Human Radiobiology. *Health Phys.*, **35**, 159-166
- Rowland, R.E., Stehney, A.F. & Lucas, H.F., Jr (1978b) Dose-response relationships for female radium dial workers. *Radiat. Res.*, **76**, 368-383
- Rowland, R.E., Stehney, A.F. & Lucas, H.F. (1983) Dose-response relationships for radium-induced bone sarcomas. *Health Phys.*, **44** (Suppl. 1), 15-31
- Rowland, R.E., Lucas, H.F. & Schlenker, R.A. (1989) External radiation doses received by female radium dial painters. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiation, pp. 67-72
- Royal, H.D. (1999) Relative biological effectiveness of external radiation vs. I-131: Review of animal data. In: Thomas, G., Karaoglu, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer*, Singapore, World Scientific, pp. 201-207
- Rubin, P. & Casarett, G.W. (1972) A direction for clinical radiation pathology, the tolerance dose. In: Vaeth, J.M., ed., *Frontiers of Radiation Therapy and Oncology*, Vol. 6, Basel/Baltimore, Karger/University Park Press, pp. 1-16
- Rundo, J. (1956) The radioactivity of Thorotrast. *Phys. Med. Biol.*, **1**, 138
- Rundo, J. (1958) *Measurements and Dosimetry of Radioactive Isotopes Deposited within the Human Body with Special Reference to Colloidal Thorium Dioxide Following Intravenous Injection*, Thesis, University of London
- Rundo, J. (1964) A survey of the metabolism of caesium in man. *Br. J. Radiol.*, **37**, 108-114
- Rundo, J. & Turner, F.M. (1992) On the biological half-life of caesium in pregnant women and in infants. *Radiat. Prot. Dosim.*, **41**, 211-216

- Ruosteenoja, E. (1991) *Indoor Radon and Risk of Lung Cancer: An Epidemiologic Study in Finland*, Doctoral Dissertation, Helsinki, Department of Public Health, University of Tampere, Helsinki, Finnish Government Printing Centre
- Ruosteenoja, E., Mäkeläinen, I., Rytömaa, T., Hakulinen, T. & Hakama, M. (1996) Radon and lung cancer in Finland. *Health Phys.*, **71**, 185–189
- Rutherford, E. & Soddy, F. (1902) The cause and nature of radioactivity. *Philos. Mag.*, **4**, 370–396
- Sabin, F.R., Doan, C.A. & Forkner, C.E. (1932) The production of osteogenic sarcomata and the effects on lymph nodes and bone marrow of intravenous injections of radium chloride and mesothorium in rabbits. *J. exp. Med.*, **56**, 267–292
- Saccomanno, G., Auerbach, O., Kuschner, M., Harley, N.H., Michels, R.Y., Anderson, M.W. & Bechtel, J.J. (1996) A comparison between the localization of lung tumors in uranium miners and in nonminers from 1947 to 1991. *Cancer*, **77**, 1278–83
- Saha, G.B., Go, R.T. & MacIntyre, W.J. (1992) Radiopharmaceuticals for cardiovascular imaging. *Nucl. Med. Biol.*, **19**, 1–20
- Saito, M. & Ishida, M.R. (1985) Estimation of absorbed dose in cell nuclei due to DNA-bound  $^{3}\text{H}$ . *Health Phys.*, **48**, 465–473
- Salassidis, K., Braselmann, H., Okladnikova, N.D., Pressl, S., Stephan, G., Snigiryova, G. & Bauchinger, M. (1998) Analysis of symmetrical translocations for retrospective biodosimetry in radiation workers of the Mayak nuclear-industrial complex (southern Urals) using FISH-chromosome painting. *Int. J. Radiat. Biol.*, **74**, 431–439
- Samet, J.M., Pathak, D.R., Morgan, M.V., Marbury, M.C., Key, C.R. & Valdivia, A.A. (1989) Radon progeny exposure and lung cancer risk in New Mexico U miners: A case-control study. *Health Phys. Soc.*, **56**, 415–421
- Samet, J.M., Pathak, D.R., Morgan, M.V., Key, C.R., Valdivia, A.A. & Lubin, J.H. (1991) Lung cancer mortality and exposure to radon progeny in a cohort of New Mexico underground uranium miners. *Health Phys.*, **61**, 745–752
- Samet, J.M., Pathak, D.R., Morgan, M.V., Coulter, D.B., James, D.S. & Hunt, W.C. (1994) Silicosis and lung cancer risk in underground uranium miners. *Health Phys.*, **66**, 450–453
- Sanders, C.L. (1972) Deposition patterns and the toxicity of transuranium elements in the lung. *Health Phys.*, **22**, 607–615
- Sanders, C.L. (1992a) Life-span studies in rats exposed to  $^{239}\text{PuO}_2$  aerosol. II. Nonpulmonary tumor formation in control and exposed groups. *J. environ. Pathol. Toxicol. Oncol.*, **11**, 265–277
- Sanders, C.S. (1992b) Pleural mesothelioma in the rat following exposure to  $^{239}\text{PuO}_2$ . *Health Phys.*, **63**, 695–697
- Sanders, C.L. & Lundgren, D.L. (1995) Pulmonary carcinogenesis in the F344 and Wistar rat after inhalation of plutonium dioxide. *Radiat. Res.*, **144**, 206–214
- Sanders, C.L. & Mahaffey, J.A. (1978) Inhalation carcinogenesis of high-fired  $^{244}\text{CmO}_2$  in rats. *Radiat. Res.*, **76**, 384–401
- Sanders, C.L. & Mahaffey, J.A. (1981) Inhalation carcinogenesis of repeated exposures to high-fired  $^{239}\text{PuO}_2$  in rats. *Health Phys.*, **41**, 629–644
- Sanders, C.L. & Mahaffey, J.A. (1990) Inhalation carcinogenesis of repeated exposures to high-fired  $^{244}\text{CmO}_2$  in rats. *Health Phys.*, **58**, 631–638

- Sanders, C.L. & McDonald, K.E. (1992) Malignancy of proliferative pulmonary lesions in the Syrian hamster following inhalation of  $^{239}\text{PuO}_2$ . *J. environ. Pathol. Toxicol. Oncol.*, **11**, 151–156
- Sanders, C.L., Dagle, G.E., Cannon, W.C., Craig, D.K., Powers, G.J. & Meier, D.M. (1976) Inhalation carcinogenesis of high-fired  $^{239}\text{PuO}_2$  in rats. *Radiat. Res.*, **68**, 349–360
- Sanders, C.L., Dagle, G.E., Cannon, W.C., Powers, G.J. & Meier, D.M. (1977) Inhalation carcinogenesis of high-fired  $^{238}\text{PuO}_2$  in rats. *Radiat. Res.*, **71**, 528–546
- Sanders, C.L., Dagle, G.E. & Mahaffey, J.A. (1992) Incidence of brain tumours in rats exposed to an aerosol of  $^{239}\text{PuO}_2$ . *Int. J. Radiat. Biol.*, **62**, 97–102
- Sanders, C.L., Lauhala, K.E., McDonald, K.E. & Sanders, G.A. (1993a) Lifespan studies in rats exposed to  $^{239}\text{PuO}_2$  aerosol. *Health Phys.*, **64**, 509–521
- Sanders, C.L., Lauhala, K.E. & McDonald, K.E. (1993b) Lifespan studies in rats exposed to  $^{239}\text{PuO}_2$  aerosol. III. Survival and lung tumours. *Int. J. Radiat. Biol.*, **64**, 417–430
- Sankaranarayanan, K., Van Duyn, A., Loos, M.J. & Natarajan, A.T. (1989) Adaptive response of human lymphocytes to low-level radiation from radioisotopes or X-rays. *Mutat. Res.*, **211**, 7–12
- dos Santos Silva, I., Jones, M., Malveiro, F. & Swerdlow, A. (1999) Mortality in the Portuguese Thorotrast Study. *Radiat. Res.*, **152**, S88–S92
- Sasaki, M.S., Takatsuji, T., Ejima, Y., Kodama, S. & Kido, C. (1987) Chromosome aberration frequency and radiation dose to lymphocytes by alpha-particles from internal deposit of Thorotrast. *Radiat. Environ. Biophys.*, **26**, 227–238
- Satow, Y., Hori, H. & Lee, J.Y. (1989) Teratogenic effect of fission neutron and tritium water on rat embryo. *Sangyo Ika Daigaku Zasshi*, **11**, 416–431
- Saunders, M.G., Taylor, D.M. & Trott, N.G. (1973) The dosimetry of  $^{67}\text{Ga}$  citrate in man. *Br. J. Radiol.*, **46**, 456–463
- Schajowicz, F. (1993) *Histological Typing of Bone Tumours*, 2nd Ed., WHO International Classification of Tumours, Berlin, Springer-Verlag
- Schales, F. (1978) Brief history of  $^{224}\text{Ra}$  usage in radiotherapy and radiobiology. *Health Phys.*, **35**, 25–32
- Schiepers, C. & Hoh, C.K. (1998) Positron emission tomography as a diagnostic tool in oncology. *Eur. Radiol.*, **8**, 1481–1494
- Schiieve, L.A., Davis, F., Roeske, J., Handler, A., Freels, S., Stinchcomb, T. & Keane, A. (1997) Evaluation of internal alpha-particle radiation exposure and subsequent fertility among a cohort of women formerly employed in the radium dial industry. *Radiat. Res.*, **147**, 236–244
- Schlenker, R.A. & Keane, A.T. (1987) Radium uptake in utero. In: Gerber, G.B., Métivier, H. & Smith, H., eds, *Age-related Factors in Radionuclide Metabolism and Dosimetry*, Dordrecht, Martinus Nijhoff, pp. 339–346
- Schlenker, R.A., Keane, A.T. & Unni, K.K. (1989) Radium 226 and 228 in humans. Comparison of radium-induced and natural bone sarcomas by histological type, subject age and site of occurrence. In: Taylor, D.M., Mays, C.W., Gerber, G.B. & Thomas, R.G., eds, *Risks from Radium and Thorotrast* (BIR Report 21), London, British Institute of Radiology
- Schmahl, W. & Kollmer, W.E. (1981) Radiation induced meningeal and pituitary tumours in the rat after prenatal application of strontium-90. *J. Cancer Res. clin. Oncol.*, **100**, 13–18

- Schmahl, W., Kollmer, W.E., Berg, D. & Kriegel, H. (1979) Postnatal effects on Wistar rat pituitary morphology and function after application of strontium-90 on day 18 of pregnancy. In: *Biological Implications of Radionuclides Released from Nuclear Industries*, Vol. 1 (IAEA-SM-237/20), Vienna, International Atomic Energy Agency, pp. 329–337
- Schmidt, P. & Kiefer, J. (1998) Deletion-pattern analysis of  $\alpha$ -particle and X-ray induced mutations at the HPRT locus of V79 Chinese hamster cells. *Mutat. Res.*, **421**, 149–161
- Schmitt-Hannig, A., Drenkard, S. & Wheatley, J. (1995) *Study on Consumer Products Containing Radioactive Substances in the EU Member States*, Luxembourg, Office for Official Publications of the European Communities
- Schneider, A.B., Ron, E., Lubin, J., Stovall, M. & Gierlowski, T.C. (1993) Dose-response relationships for radiation-induced thyroid cancer and thyroid nodules: Evidence for the prolonged effects of radiation on the thyroid. *J. clin. Endocrinol. Metab.*, **77**, 362–369
- Schoenberg, J.B., Klotz, J.B., Wilcox, H.B., Nicholls, G.P., Gil-del-Real, M.T., Stemhagen, A. & Mason, T.J. (1990) Case-control study of residential radon and lung cancer among New Jersey women. *Cancer Res.*, **50**, 6520–6524
- Schoeters, G.E.R., Luz, A. & Vanderborght, O.L.J. (1983)  $^{226}\text{Ra}$  induced bone-cancers: The effects of a delayed Na-alginate treatment. *Int. J. Radiat. Biol.*, **43**, 231–247
- Schoeters, G.E.R., Maisin, J.R. & Vanderborght, O.L.J. (1991) Toxicity of  $^{241}\text{Am}$  in male C57BL mice: Relative risk versus  $^{226}\text{Ra}$ . *Radiat. Res.*, **126**, 198–205
- Schreml, W. & Fliedner, T.M. (1977) Distribution of tritiated compounds (tritiated thymidine and tritiated water) in the mother-fetus system and its consequences for the radiotoxic effect of tritium. *Curr. Topics Radiat. Res. Q.*, **12**, 255–277
- Schwartz, G. & Dunning, D.E. (1982) Imprecision in estimates of dose from ingested  $^{137}\text{Cs}$  due to variability in human biological characteristics. *Health Phys.*, **43**, 631–645
- Searle, A.G., Beechey, C.V., Green, D. & Humphreys, E.R. (1976) Cytogenetic effects of protracted exposures to alpha-particles from plutonium-239 and to gamma-rays from cobalt-60 compared in male mice. *Mutat. Res.*, **41**, 297–310
- Seidel, A. & Volf, V. (1972) Removal of internally deposited transuranium elements by Zn-DTPA. *Health Phys.*, **22**, 779–783
- Seltzer, R.A., Kereiakes, J.G. & Saenger, E.L. (1964) Radiation exposure from radioisotopes on paediatrics. *New Engl. J. Med.*, **271**, 84–90
- Sevan'kaev, A.V., Lloyd, H. & Braselmann, H. (1995) A survey of chromosomal aberrations in lymphocytes of Chernobyl liquidators. *Radiat. Prot. Dosim.*, **58**, 85–91
- Ševc, J., Kunz, E., Tomášek, L., Placek, V. & Horáček, J. (1988) Cancer in man after exposure to Rn daughters. *Health Phys.*, **54**, 27–46
- Ševc, J., Tomášek, L., Kunz, E., Placek, V., Chmelevsky, D., Barclay, D. & Kellerer, A.M. (1993) A survey of the Czechoslovak follow-up of lung cancer mortality in uranium miners. *Health Phys.*, **64**, 355–369
- Shanahan, E.M., Peterson, D., Roxby, D., Quintana, J., Morley, A.A. & Woodward, A. (1996) Mutation rates at the glycophorin A and HPRT loci in uranium miners exposed to radon progeny. *Occup. environ. Med.*, **53**, 439–444
- Sharma, K. & Saini, M.R. (1993) Embryonic/fetal mortality after exposure to tritiated water in pregnant Swiss albino mice during different gestation periods. *Indian J. exp. Biol.*, **31**, 98–100

- Sharpe, W.D. (1983) Chronic radium intoxication: Radium osteonecrosis and cancer in relation to  $^{226}\text{Ra}$  burdens. *Health Phys.*, **44** (Suppl. 1), 149–154
- Sheu, J.-C., Sung, J.-L., Chen, D.-S., Yang, P.-M., Lai, M.-Y., Lee, C.-S., Hsu, H.-C., Chuang, C.-N., Yang, P.-C., Wang, P.-C., Lin, Y.-T. & Lee, C.-Z. (1985) Growth rate of asymptomatic hepatocellular carcinoma and its clinical implications. *Gastroenterology*, **89**, 259–266
- Shilnikova, N.S., Koshurnikova, N.A., Bolotnikova, M.G., Nifatov, A.P., Okatenko, P.V., Khokhryakov, V.F. & Romanov S.A. (1995) [Mortality from malignant liver neoplasms among personnel of 'Mayak' complex.] *Radiat. Risk*, **5**, 151–155 (in Russian)
- Sikov, M.R. (1969) Effect of age on the iodine-131 metabolism and the radiation sensitivity of the rat thyroid. *Radiat. Res.*, **38**, 449–459
- Sikov, M.R. (1972) Effect of age on the morphologic response of the rat thyroid to irradiation by iodine-131. *Radiat. Res.*, **49**, 233–244
- Sikov, M.R. (1982) Fetal and juvenile radiotoxicity. In: *Pacific Northwest Laboratory Annual Report for 1981* (PNL-4100 PT1), Springfield, VA, National Technical Information Service, pp. 113–117
- Sikov, M.R. (1983) Fetal and juvenile radiotoxicity. In: *Pacific Northwest Laboratory Annual Report for 1982* (PNL-4699 PT1), Springfield, VA, National Technical Information Service, pp. 89–93
- Sikov, M.R. (1985) Fetal and juvenile radiotoxicity. In: *Pacific Northwest Laboratory Annual Report for 1984* (PNL-5500 PT1), Springfield, VA, National Technical Information Service, pp. 43–47
- Sikov, M.R. (1987a) Fetal and juvenile radiotoxicity. In: *Pacific Northwest Laboratory Annual Report for 1986* (BNWL-6100 PT1), Springfield, VA, National Technical Information Service, pp. 47–50
- Sikov, M.R. (1987b) Placental transfer of the actinides and related heavy elements. In: Gerber, G.B., Métivier, H. & Smith, H., eds, *Age-related Factors in Radionuclide Metabolism and Dosimetry*, Dordrecht, Martinus Nijhoff, pp. 303–314
- Sikov, M.R. (1989) Tumour development following internal exposures to radionuclides during the perinatal period following prenatal exposure to radiation. In: Napalkov, N.P., Rice, J.M., Tomatis, L. & Yamasaki, H., eds, *Perinatal and Multigeneration Carcinogenesis* (IARC Scientific Publication No. 96), Lyon, IARCPress, pp. 403–419
- Sikov, M.R. & Hui, T.E. (1996) *Contribution of Maternal Radionuclide Burden to Prenatal Radiation Doses* (NUREG/CR-5631, PNL-7445 Rev. 2), Washington DC, US Nuclear Regulatory Commission
- Sikov, M.R. & Kelman, B.J. (1989) Factors affecting the placental transfer of actinides. *Health Phys.*, **57**, 109–114
- Sikov, M.R. & Lofstrom, J.E. (1957) The dosimetry and lethal effects of maternally administered phosphorus-32 after 14 and 17 days of gestation in the rat. *Phys. Med. Biol.*, **2**, 157–168
- Sikov, M.R. & Mahlum, D.D. (1968) Cross-placental transfer of selected actinides in the rat. *Health Phys.*, **14**, 205–208
- Sikov, M.R. & Mahlum, D.D. (1972) Age-dependence of  $^{239}\text{Pu}$  metabolism and effect in the rat. In: Stover, B.J. & Jee, W.S.S., eds, *Radiobiology of Plutonium*, Salt Lake City, J.W. Press, pp. 261–272
- Sikov, M.R. & Mahlum, D.D. (1975) Toxicity of  $^{241}\text{Am}$  and  $^{244}\text{Cm}$  after administration at nine days of gestation in the rat (Abstract). *Radiat. Res.*, **62**, 565

- Sikov, M.R. & Noonan, T.R. (1957) The effects of irradiation with phosphorus-32 on the viability and growth of rat embryos. *Radiat. Res.*, **7**, 541–550
- Sikov, M.R. & Noonan, T.R. (1958) Anomalous development induced in the embryonic rat by the maternal administration of radiophosphorus. *Am. J. Anat.*, **103**, 137–162
- Sikov, M.R., Lofstrom, J.E. & Noonan, T.R. (1958) Effects of maternally administered P<sup>32</sup> on fetal development. In: *Proceedings of the Second International Conference on Peaceful Uses of Atomic Energy*, London, Pergamon Press, pp. 71–75
- Sikov, M.R., Mahlum, D.D. & Howard, E.B. (1972) Effect of age on the morphologic response of the rat thyroid to irradiation by iodine-131. *Radiat. Res.*, **49**, 233–244
- Sikov, M.R., Zwicker, G.M., Hess, J.O. & Mahlum, D.D. (1978) Late effects of perinatally administered plutonium. In: Mahlum, D.D., Sikov, M.R., Hackett, P.L. & Andrew, X., eds, *Developmental Toxicology of Energy-related Pollutants* (CONF-771017), Springfield, VA, National Technical Information Service, pp. 361–374
- Sikov, M.R., Buschbom, R.L., Carr, D.B., Dagle, G.E., Hackett, P.L., Kelman, B.J., Mahlum, D.D., McClanahan, B.J., Rommereim, D.N. & Sasser, L.B. (1986) *Fetal and Juvenile Radiotoxicity, Pacific Northwest Laboratory Annual Report for 1985*, Richland, Pacific Northwest Laboratory, pp. 45–49
- Sikov, M.R., Mahlum, D.D., Dagle, G.E., Daniel, J.L. & Goldman, M. (1989) Mechanistic explanations for the elevated susceptibility of the perinatal thyroid gland to radiogenic cancer. In: Park, J.F. & Pelroy, R.A., eds, *Multilevel Health Effects Research: From Molecules to Man*, Columbus, OH, Battelle Press, pp. 283–293
- Sikov, M.R., Cross, F.T., Mast, T.J., Palmer, H.E., James, A.C., & Thrall, K.D. (1992) Developmental toxicology of radon exposures. In: Cross, F.T., ed., *Indoor Radon and Lung Cancer: Reality or Myth? Twenty-ninth Hanford Symposium on Health and the Environment*, Columbus, OH, Battelle Press, pp. 677–691
- Silberstein, E.B. (1993) The treatment of painful osseous metastases with phosphorus-32 labeled phosphates. *Semin. Oncol.*, **20** (Suppl. 2), 10–21
- da Silva Horta, J., da Silva Horta, M.E., Cayolla da-Motta, L. & Tavares, M.H. (1978) Malignancies in Portuguese Thorotrast patients. *Health Phys.*, **35**, 137–151
- Simmons, D.J. & Holtzman, R.B. (1983) Plugged Haversian canals and local dose in radium cases. *Health Phys.*, **44** (Suppl. 1), 179–186
- Simmons, J.A., Cohn, P. & Min, T. (1996) Survival and yields of chromosome aberrations in hamster and human lung cells irradiated by alpha particles. *Radiat. Res.*, **145**, 174–180
- Simon, S.L., Till, J.E., Lloyd, R.D., Kerber, R.L., Thomas, D.C., Preston-Martin, S., Lyon, J.L. & Stevens, W. (1995) The Utah Leukemia Case-Control Study: Dosimetry methodology and results. *Health Phys.*, **68**, 460–471
- Slauson, D.O., Hahn, F.F., Benjamin, S.A., Chiffelle, T.L. & Jones, R.K. (1976) Inflammatory sequences in acute pulmonary radiation injury. *Am. J. Pathol.*, **82**, 549–572
- Slauson, D.O., Hahn, F.F. & Chiffelle, T.L. (1977) The pulmonary vascular pathology of experimental radiation pneumonitis. *Am. J. Pathol.*, **88**, 635–654
- Smida, J., Zitzelsberger, H., Kellerer, A.M., Lehmann, L., Minkus, G., Negele, T., Spelsberg, F., Hieber, L., Demidchik, E.P., Lengfelder, E. & Bauchinger, M. (1997) p53 Mutations in childhood thyroid tumours from Belarus and in thyroid tumours without radiation history. *Int. J. Cancer*, **73**, 802–807

- Smith, T. & Edmonds, C.J. (1984) Radiation dosimetry in the treatment of thyroid carcinoma by  $^{131}\text{I}$ . *Rad. Prot. Dosim.*, **5**, 141–149
- Smith, H. & Stather, J.W. (1976) *Human Exposure to Radiation Following the Release of Radioactivity from a Reactor Accident: A Quantitative Assessment of the Biological Consequences* (NRPB Report 52), Harwell, National Radiological Protection Board
- Smith, D.I., Lord, D.J. & Tait, S.D.R. (1991) Ionising radiation exposure to the Dounreay workforce during 1987 and 1988. *Radiat. Protect. Dosim.*, **36**, 177–181
- Smith, B.J., Field, R.W. & Lynch, C.F. (1998) Residential  $^{222}\text{Rn}$  exposure and lung cancer: Testing the linear no-threshold theory with ecologic data. *Health Phys.*, **75**, 11–17
- Sobolev, B., Likhtarev, I., Kairo, I., Tronko, N., Oleynik, V. & Bogdanova, T. (1996) Radiation risk assessment of the thyroid cancer in Ukrainian children exposed due to Chernobyl. In: Karaoglu, A., Desmet, G., Kelly, G.N. & Menzel, H.G., eds, *The Radiological Consequences of the Chernobyl Accident* (EUR 16544 EN), Luxembourg, Office for Official Publications of the European Communities, pp. 741–748
- Soini, Y., Welsh, J.A., Ishak, K.G. & Bennett, W.P. (1995) p53 Mutations in primary hepatic angiosarcomas not associated with vinyl chloride exposure. *Carcinogenesis*, **16**, 2879–2881
- Sonnabend, E., Spiess, H. & Mays, C.W. (1986) Tooth breakage in patients injected with  $^{224}\text{Ra}$ . *Strahlentherapie*, **80** (Suppl.), 60–64
- Sontag, W., Wirth, R., Luz, A., Schäffer, E. & Wolf, V. (1997) Dosimetry and pathology of  $^{237}\text{Np}$  in female rats. *Hum. exp. Toxicol.*, **16**, 89–100
- Speert, H., Quimby, E.H. & Werner, S.C. (1951) Radioiodine uptake by the fetal mouse thyroid and resultant effects in later life. *Surg. Gynecol. Obst.*, **93**, 230–242
- Speizer, F.E. & Frank, N.R. (1966) The uptake and release of  $\text{SO}_2$  by the human nose. *Arch. environ. Health*, **12**, 725–728
- Spiers, F.W. & Beddoe, A.H. (1983) Sites of incidence of osteosarcoma in the long bones of man and the beagle. *Health Phys.*, **44** (Suppl. 1), 49–64
- Spiers, F.W., Beddoe, A.H., King, S.D., Hayter, C.J., Smith, A.H., Burkinshaw, L. & Roberts, B.E. (1976) The absorbed dose to bone marrow in the treatment of polycythemia by  $^{32}\text{P}$ . *Br. J. Radiol.*, **49**, 133–140
- Spiers, F.W., King, S.D. & Beddoe, A.H. (1977) Measurements of endosteal surface areas in human long bones: Relationship to sites of occurrence of osteosarcoma. *Br. J. Radiol.*, **50**, 769–776
- Spiers, F.W., Lucas, H.F., Rundo, J. & Anast, G.A. (1983) Leukaemia incidence in the US dial workers. *Health Phys.*, **44** (Suppl. 1), 65–72
- Spiess, H. (1956) [Acute radiation-induced damages after treatment with Peteosthor in children]. *Dtsch. med. Wschr.*, **81**, 1053–1054 (in German)
- Spiess, H. (1995) The RA-224 study: Past, presence and future. In: van Kaick, G., Karaoglu, A. & Kellerer, A.M., eds, *Health Effects of Internally Deposited Radionuclides: Emphasis on Radium and Thorium* (EUR 15877 EN), Singapore, World Scientific, pp. 157–163
- Spiess, H. & Mays, C.W. (1970, 1971) Bone cancers induced by  $^{224}\text{Ra}$  (ThX) in children and adults. *Health Phys.*, **19**, 713–729 and Corrigendum. *Health Phys.*, **20**, 543–545 (1971)
- Spiess, H. & Mays, C.W. (1979a) Exostoses induced by  $^{224}\text{Ra}$  (ThX) in children. *Eur. J. Pediatr.*, **132**, 271–276

- Spiess, H. & Mays, C.W. (1979b) Liver diseases in patients injected with  $^{224}\text{Ra}$ . *Environ. Res.*, **18**, 55–60
- Spiess, H., Mays, C.W. & Spiess-Paulus, E. (1986) Growth retardation in children injected with  $^{224}\text{-Ra}$ . In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 45–50
- Spiehoff, A., Wesch, H., Höver, K.-H. & Wegener, K. (1992) Contributed paper. The combined and separate action of neutron radiation and zirconium dioxide on the liver of rats. *Health Phys.*, **63**, 111–118
- Stabin, M.G., Tagesson, M., Thomas, S.R., Ljungberg, M. & Strand, S.E. (1999) Radiation dosimetry in nuclear medicine. *Appl. Radiat. Isot.*, **50**, 73–87
- Stather, J.W. & Greenhalgh, J.R. (1983) *The Metabolism of Iodine in Children and Adults* (NRPB Report 140), Chilton, National Radiological Protection Board Report
- Stather, J.W. & Phipps, A.W. (1998) The work of Committee 2 of ICRP in developing dose coefficients for the embryo and fetus. *Radiat. Prot. Dosim.*, **79**, 299–302
- Stather, J.W., Adams, N., Gray, S.A. & Rees, M. (1987) Comparative studies on the transfer of radionuclides to the fetus in the rat — Implications for human dosimetry. In: Gerber, G.B., Métivier, H. & Smith, H., eds, *Age-related Factors in Radionuclide Metabolism and Dosimetry*, Dordrecht, Martinus Nijhoff, pp. 371–380
- Stather, J.W., Muirhead, C.R., Edwards, A.A., Harrison, J.D., Lloyd, D.C. & Wood, N.R. (1988) *Health Effects Models Developed from the 1988 UNSCEAR Report* (NRPB Report 226), Chilton, National Radiological Protection Board, pp. 6–7
- Stebbins, J.H. (1998) Radium and leukemia: Is current dogma valid? *Health Phys.*, **74**, 486–488
- Stebbins, J.H. (1999) A case study of selected medical findings among plutonium injectees. *Health Phys.*, **76**, 477–488
- Stebbins, J.H., Lucas, H.F. & Stehney, A.F. (1984) Mortality from cancers of major sites in female radium dial workers. *Am. J. ind. Med.*, **5**, 435–459
- Stefani, F.H., Spiess, H. & Mays, C.W. (1986) Cataracts in patients injected with  $^{224}\text{Ra}$ . In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 51–59
- Stegelmeier, B.L., Gillett, N.A., Rebar, A.H. & Kelly, G. (1991) The molecular progression of plutonium-239-induced rat lung carcinogenesis: Ki-ras expression and activation. *Mol. Carcinog.*, **4**, 43–51
- Stehney, A.F. (1999) Organ distribution of thorium in thorium workers: Good agreement with new models of the International Commission on Radiological Protection. *Radiat. Res.*, **152**, S110–S114
- Stehney, A.F., Polednak, A.P., Rundo, J., Brues, A.M., Lucas, H.F., Jr., Patten, B.C. & Rowland, R.E. (1980) *Health Status and Body Radioactivity of Former Thorium Workers, Interim Report* (NUREG/CR-1420; ANL-80-37), Washington DC, US Nuclear Regulatory Commission
- Steinbuch, M., Weinberg, C.R., Buckley, J.D., Robison, L.L. & Sandler, D.P. (1999) Indoor residential radon exposure and risk of childhood acute myeloid leukaemia. *Br. J. Cancer*, **81**, 900–906
- Stenhouse, M.J. & Baxter, M.S. (1977a) Bomb  $^{14}\text{C}$  and human radiation burden. *Nature*, **267**, 825–827

- Stenhouse, M.J. & Baxter, M.S. (1977b) Bomb 14C as a biological tracer. *Nature*, **267**, 828–832
- Stenström, K., Leide-Svegborn, S., Erlandsson, B., Hellborg, R., Mattsson, S., Nilsson, L.E., Nosslin, B., Skog, G. & Wiebert, A. (1996) Application of accelerator mass spectrometry (AMS) for high-sensitivity measurements of  $^{14}\text{CO}_2$  in long-term studies of fat metabolism. *Appl. Radiat. Isot.*, **47**, 417–422
- Stevens, W., Atherton, D.R., Bates, D., Lloyd, R.D., Buster, D.S. & Bruenger, F.W. (1977) Retention and distribution of  $^{241}\text{AmIII}$  in neonatal beagles. *Health Phys.*, **33**, 553–559
- Stevens, W., Thomas, D.C., Lyon, J.L., Till, J.E., Kerber, R.A., Simon, S.L., Lloyd, R.D., Elghany, N.A. & Preston-Martin, S. (1990) Leukemia in Utah and radioactive fallout from the Nevada test site. A case-control study. *J. Am. med. Assoc.*, **264**, 585–591 [Published erratum appears in *J. Am. med. Assoc.* (1991), **265**, 461]
- Stevenson, A.C., Bedford, J., Dolphin, G.W., Purrott, R.J., Lloyd, D.C., Hill, A.G.S., Hill, H.F.H., Gumpel, J.M., Williams, D., Scott, J.T., Ramsey, N.W., Bruckner, F.E. & Fearn, C.B.D'A. (1973) Cytogenetic and scanning study of patients receiving intra-articular injections of gold-198 and yttrium-90. *Ann. rheum. Dis.*, **32**, 112–123
- Stewart, N.G. & Crooks, R.N. (1958) Long-range travel of the radioactive cloud from the accident at Windscale. *Nature*, **182**, 627–628
- Stidley, C.A. & Samet, J.M. (1993) A review of ecologic studies of lung cancer and indoor radon. *Health Phys.*, **65**, 234–251
- Stidley, C.A. & Samet, J.M. (1994) Assessment of ecologic regression in the study of lung cancer and indoor radon. *Am. J. Epidemiol.*, **139**, 312–322
- Stover, B.J. & Jee, W.S.S. (1963) Some effects of long-term alpha irradiation on the composition and structure of bone. *Health Phys.*, **9**, 267–275
- Stover, B.J., Bruenger, F.W. & Stevens, W. (1970) Association of americium with ferritin in the canine liver. *Radiat. Res.*, **43**, 173–186
- Stradling, G.N., Gray, S.A., Moody, J.C., Hodgson, A., Raymond, K.N., Durbin, P.W., Rodgers, S.J., White, D.L. & Turowski, P.N. (1991) The efficacy of DFO-HOPO, DTPA-DX and DTPA for enhancing the excretion of plutonium and americium from the rat. *Int. J. Radiat. Biol.*, **59**, 1269–1277
- Stradling, G.N., Gray, S.A., Ellender, M., Moody, J.C., Hodgson, A., Pearce, M., Wilson, I., Burgada, R., Bailly, T., Leroux, Y.G.P., El Manouni, D., Raymond, K.N. & Durbin, P.W. (1992) The efficacies of 3,4,3-LIHOPO and DTPA for enhancing the excretion of plutonium and americium from the rat: Comparison with other siderophore analogues. *Int. J. Radiat. Biol.*, **62**, 487–497
- Stram, D.O., Langholz, B., Huberman, M. & Thomas, D.C. (1999a) Correcting for exposure measurement error in a reanalysis of lung cancer mortality for the Colorado Plateau uranium miners cohort. *Health Phys.*, **77**, 265–275
- Stram, D.O., Langholz, B., Huberman, M. & Thomas, D. (1999b) Measurement error corrections for the analysis of lung cancer mortality in the Colorado Plateau uranium miners cohort. In: Ron, E. & Hoffman, F.O., eds, *Uncertainties in Radiation Dosimetry and their Impact on Dose-Response Analyses* (NIH Publication No. 99-4541), Bethesda, MD, National Cancer Institute, pp. 192–199
- Straume, T. & Carsten, A.L. (1993) Tritium radiobiology and relative biological effectiveness. *Health Phys.*, **65**, 657–672

- Streffer, C., van Beuningen, D. & Elias, S. (1977) Comparative effects of tritiated water and thymidine on the preimplanted mouse embryo *in vitro*. *Curr. Topics Radiat. Res. Q.*, **12**, 182–193
- Stroud, A.N. (1977) Chromosome aberrations induced in Syrian hamster lung cells by inhaled  $^{238}\text{PuO}_2\text{ZrO}_2$  particles. *Radiat. Res.*, **69**, 583–590
- Stsiazhkko, V.A., Tsyb, A.F., Tronko, N.D., Souchkevitch, G. & Baverstock, K.F. (1995) Childhood thyroid cancer since accident at Chernobyl (Letter to the Editor). *Br. med. J.*, **310**, 801
- Sullivan, M.F. (1980) Absorption of actinide elements from the gastrointestinal tract of rats, guinea pigs and dogs. *Health Phys.*, **38**, 159–171
- Sullivan, M.F. & Gorham, L.S. (1982) Further studies on the absorption of actinide elements from the gastrointestinal tract of neonatal animals. *Health Phys.*, **43**, 509–519
- Sullivan, M.F. & Ruemmler, P.S. (1986) Effectiveness of DTPA therapy when administered intragastrically or intraperitoneally to remove Pu from adult or neonatal rats. *Health Phys.*, **51**, 641–646
- Sullivan, D.J., McDonald, T.P. & Bell, M.C. (1969) Acute radiotoxicity of  $^{144}\text{Ce}$ – $^{144}\text{Pr}$  after intravenous administration to sheep. *Cornell Vet.*, **59**, 236–249
- Sullivan, M.F., Ruemmler, P.S., Beamer, J.L., Mahony, T.D. & Cross, F.T. (1978) Acute toxicity of beta-emitting radionuclides that may be released in a reactor accident and ingested. *Radiat. Res.*, **73**, 21–36
- Sullivan, M.F., Miller, B.M. & Ryan, J.L. (1983) Absorption of thorium and protactinium from the gastrointestinal tract in adult mice and rats and neonatal rats. *Health Phys.*, **44**, 425–428
- Sullivan, M.F., Cross, F.T. & Dagle, G.E. (1987) Dosimetry of the gastrointestinal tract. In: Gerber, G.B., Métivier, H. & Smith, H., eds, *Age-related Factors in Radionuclide Metabolism*, Dordrecht, Martinus Nijhoff, pp. 49–66
- Sundell-Bergman, S. & Johanson, K.J. (1980) Repairable and unrepairable DNA strand breaks induced by decay of  $^3\text{H}$  and  $^{125}\text{I}$  incorporated into DNA of mammalian cells. *Radiat. environ. Biophys.*, **18**, 239–248
- Sundell-Bergman, S., Bergman, R. & Johanson, K.J. (1985) Chromosome damage induced by decay of  $^3\text{H}$  and  $^{125}\text{I}$  incorporated into DNA of Chinese hamster cells. *Mutat. Res.*, **149**, 257–263
- Sutow, W.W., Conard, R.A. & Griffith, K.M. (1965) Growth status of children exposed to fallout radiation on the Marshall Islands. *Pediatrics*, **36**, 721–731
- Svensson, C., Pershagen, G. & Hrubec, Z. (1988) A comparative study on different methods of measuring Rn concentrations in homes. *Health Phys.*, **55**, 895–902
- Svensson, C., Pershagen, G. & Klominek, J. (1989) Lung cancer in women and type of dwelling in relation to radon exposure. *Cancer Res.*, **49**, 1861–1865
- Svoboda V. & Bubeníková, D. (1990) Hemoblastoses in mice contaminated with low activities of  $^{239}\text{Pu}$ . *Neoplasma*, **37**, 639–646
- Svoboda, V., Kofránek, V., Kotašková, Z., Bubeníková, D. & Dvorák, V. (1977) Planimetric evaluation and comparison of roentgenograms of osteogenic sarcomas induced by  $^{226}\text{Ra}$  and  $^{224}\text{Ra}$  in mice. *Neoplasma*, **24**, 311–318
- Svoboda, V., Bubeníková, D. & Kotasková, Z. (1981) Myeloid leukaemia in  $^{239}\text{Pu}$ -treated mice. *J. Cancer Res. clin. Oncol.*, **100**, 255–262

- Svoboda, V., Bubeníková, D. & Kotasková, Z. (1982) Some quantitative micromorphological characteristics of granulocytic leukaemia in  $^{239}\text{Pu}$ -injected mice and untreated controls. *Neoplasma*, **29**, 175–182
- Svoboda, V., Sedláčk, A., Kypenová, H. & Bubeníková, D. (1987) Long-term effects of low-level  $^{239}\text{Pu}$  contamination on murine bone-marrow stem cells and their progeny. *Int. J. Radiat. Biol.*, **52**, 517–526
- Szot, Z., Rochalska, M., Wojewodzka, M., Chimiak, A. & Przychodzen, W. (1986) Removal of  $^{239}\text{Pu}$  from mice with 3,4,3 LICAM(C) or N,N'N'',N'''-tetra(2,3-dihydroxybenzoyl)-spermine. *Radiat. environ. Biophys.*, **25**, 31–35
- Szur, L. & Lewis, S.M. (1966) The haematological complications of polycythaemia vera and treatment with radioactive phosphorus. *Br. J. Radiol.*, **39**, 122–130
- Takeda, H. (1991) Incorporation and distribution of tritium in rats after chronic exposure to various tritiated compounds. *Int. J. Radiat. Biol.*, **59**, 843–853
- Takeda, H., Nishimura, Y. & Inaba, J. (1994) Transfer of tritium to prenatal and neonatal rats from their mothers exposed to tritiated compounds. *Radiat. Prot. Dosim.*, **53**, 281–284
- Talbot, R.J. & Moores, S.R. (1985) The development and interlobar distribution of plutonium-induced pulmonary fibrosis in mice. *Radiat. Res.*, **103**, 135–148
- Talbot, R.J., Newton, D., Warner, A.J., Walters, B. & Sherlock, J.C. (1993) Human uptake of  $^{137}\text{Cs}$  in mutton. *Health Phys.*, **64**, 600–604
- Talbott, E.O., Youk, A.O., McHugh, K.P., Shire, J.D., Zhang, A., Murphy, B.P. & Engberg, R.A. (2000) Mortality among the residents of the Three Mile Island accident area: 1979–1992. *Environ. Health Perspectives*, **108**, 545–552
- Tanosaki, S., Minamihisamatsu, M., Ishihara, T., Hachiya, M., Kumatori, T. & Akashi, M. (1999) Chromosome aberrations in bone marrow cells from Japanese patients with thorotrastosis. *Radiat. Res.*, **152** (Suppl.), S128–S132
- Taplin (1979) The history of lung imaging with radionuclides. *Semin. nucl. Med.*, **9**, 178–185
- Tawn, E.J., Hall, J.W. & Schofield, G.B. (1985) Chromosome studies in plutonium workers. *Int. J. Radiat. Biol.*, **47**, 599–610
- Taylor, D.M. (1986) The comparative carcinogenicity of  $^{239}\text{Pu}$ ,  $^{241}\text{Am}$  and  $^{244}\text{Cm}$  in the rat. In: Thompson, R.C. & Mahaffey, J.A., eds, *Life-span Radiation Effects Studies in Animals: What Can They Tell Us? Proceedings of the Twenty-second Hanford Life Sciences Symposium, Richmond, 27–29 September 1983*, Washington DC, US Department of Energy, pp. 404–412
- Taylor, D.M. & Bligh, P.H. (1992) The transfer of  $^{45}\text{Ca}$ ,  $^{85}\text{Sr}$  and  $^{140}\text{Ba}$  from mother to newborn in rats. *Radiat. Prot. Dosim.*, **41**, 143–145
- Taylor, G.N., Jee, W.S.S., Christensen, W.R., Rehfeld, C.E. & Nebeker, N. (1965) Thorium-228 induced fractures in beagles. In: Jee, W.S.S., ed., *Research in Radiobiology* (COO-119-232), Salt Lake City, University of Utah Press, pp. 74–87
- Taylor, G.N., Dougherty, T.F., Mays, C.W., Lloyd, R.D., Atherton, D.R. & Jee, W.S.S. (1972a) Radium-induced eye melanomas in dogs. *Radiat. Res.*, **51**, 361–373
- Taylor, G.N., Jee, W.S.S., Williams, J.L. & Shabestari, L. (1972b) Hepatic changes induced by  $^{239}\text{Pu}$ . In: Stover, B.J. & Jee, W.S.S., eds, *Radiobiology of Plutonium*, Salt Lake City, UT, J.W. Press, pp. 105–127
- Taylor, G.N., Gardner, P., Mays, C.W., Wrenn, M.C. & Charrier, K. (1981) Incidence of plutonium-induced bone cancer in neutered mice. *Cancer Res.*, **41**, 971–973

- Taylor, G.N., Mays, C.W., Lloyd, R.D., Gardner, P.A., Talbot, L.R., McFarland, S.S., Pollard, T.A., Atherton, D.R., VanMoorhem, D., Brammer, D., Brammer, T.W., Ayoroa, G. & Taysum, D.H. (1983) Comparative toxicity of  $^{226}\text{Ra}$ ,  $^{239}\text{Pu}$ ,  $^{241}\text{Am}$ ,  $^{249}\text{Cf}$ , and  $^{252}\text{Cf}$  in C57BL/Do black and albino mice. *Radiat. Res.*, **95**, 584–601
- Taylor, G.N., Mays, C.W., Lloyd, R.D., Jones, C.W., Rojas, J., Wrenn, M.E., Ayoroa, G., Kaul, A. & Riedel, W. (1986) Liver cancer induction by  $^{241}\text{Am}$  and Thorotrast in deer mice and grasshopper mice. In: Gössner, W., Berber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 172–177
- Taylor, G.N., Lloyd, R.D., Mays, C.W., Angus, W., Miller, S.C., Shabestari, L. & Hahn, F.F. (1991) Plutonium or americium-induced liver tumors in beagles. *Health Phys.*, **61**, 337–347
- Taylor, G.N., Lloyd, R.D. & Mays, C.S. (1993) Liver cancer induction by  $^{239}\text{Pu}$ ,  $^{241}\text{Am}$  and thorotrast in the grasshopper mouse, *Onychomys leucogaster*. *Health Phys.*, **64**, 141–146
- Taylor, G.N., Lloyd, R.D., Mays, C.W., Miller, S.C., Jee, W.S.S., Mori, S., Shabestari, L. & Li, X. J. (1997) Relationship of natural incidence and radiosensitivity for bone cancer in dogs. *Health Phys.*, **73**, 679–683
- Taylor, G.N., Lloyd, R.D. & Miller, S.C. (2000) Radium-induced eye melanomas in dogs. *Health Phys.*, **79**, 196–198
- Terzaghi-Howe, M., Ford, J.R. & Turner, J.E. (1996) Influence of cell position relative to planar alpha-particle sources on survival and preneoplastic transformation of primary rat tracheal epithelial cells. *Radiat. Res.*, **145**, 432–441
- Teta, M.J. & Ott, M.G. (1988) A mortality study of a research, engineering, and metal fabrication facility in western New York state. *Am. J. Epidemiol.*, **127**, 540–551
- Thacker, J. (1986) The nature of mutants induced by ionising radiation in cultured hamster cells. *Mutat. Res.*, **160**, 267–275
- Thacker, J., Stretch, A. & Goodhead, D.T. (1982) The mutagenicity of  $\alpha$ -particles from plutonium-238. *Radiat. Res.*, **92**, 343–352
- Thomas, R.G. (1999) Is radium the only radionuclide that displays a practical threshold dose? (Abstract) *Radiat. Res.*, **152**, S159
- Thomas, R.G. & Smith, D.M. (1979) Lung tumours from  $\text{PuO}_2\text{-ZrO}_3$  aerosol particles in Syrian hamsters. *Int. J. Cancer*, **24**, 594–599
- Thomas, R.G., McClellan, R.O., Thomas, R.L., Chiffelle, T.L., Hobbs, C.H., Jones, R.K., Mauderly, J.L. & Pickrell, J.A. (1972) Metabolism, dosimetry and biological effects of inhaled  $^{241}\text{Am}$  in beagle dogs. *Health Phys.*, **22**, 863–871
- Thomas, R.G., Durbin, P.W., McInroy, J.F. & Healy, J.W. (1989) Estimation of human gonadal Pu and Ce concentrations from animal data. *Health Phys.*, **57**, 97–107
- Thomas, D., Pogoda, J., Langholz, B. & Mack, W. (1994) Temporal modifiers of the radon-smoking interaction. *Health Phys.*, **66**, 257–262
- Thompson, R.C. (1982) Neptunium — The neglected actinide: A review of the biological and environmental literature. *Radiat. Res.*, **90**, 1–32
- Thompson, D.E., Mabuchi, K., Ron, E., Soda, M., Tokunaga, M., Ochikubo, S., Sugimoto, S., Ikeda, T., Terasaki, M., Izumi, S. & Preston, D.L. (1994) Cancer incidence in atomic bomb survivors. Part II. Solid tumors, 1958–1987. *Radiat. Res.*, **137**, S17–S67
- Thornberg, C. & Mattsson, S. (2000) Increased  $^{137}\text{Cs}$  metabolism during pregnancy. *Health Phys.*, **78**, 502–506

- Tierney, L.A., Hahn, F.F. & Lechner, J.F. (1996) *p53, erbB-2 and K-ras* gene alterations are rare in spontaneous and plutonium-239-induced canine lung neoplasia. *Radiat. Res.*, **145**, 181–187
- Till, J.E., Simon, S.L., Kerber, R., Lloyd, R.D., Stevens, W., Thomas, D.C., Lyon, J.L. & Preston-Martin, S. (1995) The Utah Thyroid Cohort Study: Analysis of the dosimetry results. *Health Phys.*, **68**, 472–483
- Tirmarche, M., Raphalen, A., Allin, F., Chameaud, J. & Bredon, P. (1993) Mortality of a cohort of French uranium miners exposed to relatively low radon concentrations. *Br. J. Cancer*, **67**, 1090–1097
- Tokarskaya, Z.B., Okladnikova, N.D. & Aristov, V.P. (1993) [Location of lung cancer in persons who worked with plutonium-239.] *Med. Tr. Prom. Ekol.*, **5-6**, 23–25 (in Russian)
- Tokarskaya, Z.B., Okladnikova, N.D. & Belyaeva, Z.D. (1994) [Evaluation of radiation and non-radiation factors in the development of lung cancer in radiochemical plant employees.] *Vop. Onkol.*, **40**, 165–170 (in Russian)
- Tokarskaya, Z.B., Okladnikova, N.D., Belyaeva, Z.D. & Drozhko, E.G. (1995) The influence of radiation and nonradiation factors on the lung cancer incidence among the workers of the nuclear enterprise Mayak. *Health Phys.*, **69**, 356–366
- Tokarskaya, Z.B., Okladnikova, N.D. & Belyaeva, Z.D. (1996a) [The ‘dose–response’ mechanism of tumorigenesis in plutonium workers.] *Vop. Onkol.*, **42**, 48–52 (in Russian)
- Tokarskaya, Z.B., Okladnikova, N.D., Belyaeva, Z.D. & Aristov, V.P. (1996b) [The influence of radiation and other factors on the genesis of different histological patterns of lung cancer in plutonium workers.] *Vop. Onkol.*, **42**, 43–47 (in Russian)
- Tokarskaya, Z.B., Okladnikova, N.D., Belyaeva, Z.D. & Drozhko, E.G. (1997a) Multifactorial analysis of lung cancer dose–response relationships for workers at the Mayak nuclear enterprise. *Health Phys.*, **73**, 899–905
- Tokarskaya, Z.B., Khokhryakov, V.F., Okladnikova, N.D., Belyaeva, Z.D. & Zhuntova, G.V. (1997b) [Radiation factors and smoking interaction at lung cancer incidence for workers at a nuclear enterprise.] *Radiat. Biol. Radioekol.*, **37**, 918–925 (in Russian)
- Tolstykh, E.I., Degteva, M.O., Kozheurov, V.P. & Burmistrov, D.S. (1998) Strontium transfer from maternal skeleton to the fetus estimated on the basis of the Techa River data. *Radiat. Prot. Dosim.*, **79**, 307–310
- Tomášek, L. & Darby, S.C. (1995) Recent results from the study of West Bohemian uranium miners exposed to radon and its progeny. *Environ. Health Perspectives*, **103**, 55–57
- Tomášek, L. & Placek, V. (1999) Radon exposure and lung cancer risk: Czech cohort study. *Radiat. Res.*, **152**, S59–S63
- Tomášek, L., Darby, S.C., Swerdlow, A.J., Placek, V. & Kunz, E. (1993) Radon exposure and cancers other than lung cancer among uranium miners in West Bohemia. *Lancet*, **341**, 919–923
- Tomášek, L., Darby, S.C., Fearn, T., Swerdlow, A.J., Placek, V. & Kunz, E. (1994a) Patterns of lung cancer mortality among uranium miners in West Bohemia with varying rates of exposure to radon and its progeny. *Radiat. Res.*, **137**, 251–261
- Tomášek, L., Swerdlow, A.J., Darby, S.C., Placek, V. & Kunz, E. (1994b) Mortality in uranium miners in West Bohemia: A long term cohort study. *Occup. environ. Med.*, **51**, 308–315
- Toohey, R.E. & Kathren, R.L. (1995) Overview and dosimetry of the Hanford americium accident case. *Health Phys.*, **69**, 310–317

- Török, P., Schmahl, W., Meyer, I. & Kistner, G. (1979) Effects of a single injection of tritiated water during organogeny on the prenatal and postnatal development of mice. In: *Biological Implications of Radionuclides Released from Nuclear Industries*, Vol. 1 (IAEA-SM-237/24), Vienna, International Atomic Energy Agency, pp. 241–253
- Troch, P. (1949) *Peteosthor. Neue Wege des Heilens* [Peteosthor. New therapies], Braunschweig, Vieweg & Sohn (in German)
- Tronko, M.D., Bogdanova, T.I., Komissarenko, I.V., Epstein, O.V., Oliynyk, V., Kovalenko, A., Likhtarev, I.A., Kairo, I., Peters, S.B. & LiVolsi, V.A (1999) Thyroid carcinoma in children and adolescents in Ukraine after the Chernobyl nuclear accident: Statistical data and clinicomorphologic characteristics. *Cancer*, **86**, 149–156
- Tso, T.C., Harley, N. & Alexander, L.T. (1966) Sources of lead-210 and polonium-210 in tobacco. *Science*, **153**, 880–882
- Tsyb, A.F., Ivanov, V.K., Airapetov, S.A., Gapin, E.A., Maksiutov, M.A., Rozhkov, O.V., Stadnik, O.E., Chekin, S.I. & Saakian, A.K. (1992) Epidemiological analysis of data on liquidators of the Chernobyl accident living in Russia. *Med. Radiol.*, **9/10**, 44–47
- Tsyb, A.F., Shakhtar, V.V., Lushnikov, E.F., Stepanenko, V.F., Snykov, V.P., Parshkov, E.M. & Trofimova, S.F. (1999) Development of cancer and non-cancer thyroid diseases in children and adolescents after the Chernobyl accident. In: Thomas, G., Karaoglu, A. & Williams, E.D., eds, *Radiation and Thyroid Cancer*, Singapore, World Scientific, pp. 79–87
- Tubiana, M., Attie, E. & Parmentier, C. (1975) [Outcome of polycythaemia vera treated with radioactive phosphorus. A series of 303 patients followed for 12 to 24 years.] *Nouv. Presse méd.*, **4**, 1781–1786 (in French)
- Twardock, A.R. (1967) Placental transfer of calcium and strontium in the guinea pig. *Am. J. Physiol.*, **213**, 837–842
- Umeki, S., Kyoizumi, S., Kusunoki, Y., Nakamura, N., Saski, M., Mori, T., Ishikawa, Y., Cologne, J.B. & Akiyama, M. (1991) Flow cytometric measurements of somatic cell mutations in Thorotrast patients. *Jpn. J. Cancer Res.*, **82**, 1349–1353
- Unni, K.K. (1996) *Dahlin's Bone Tumors, General Aspects and Data on 11,087 Cases*, 5th Ed., Philadelphia, Lippincott-Raven
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (1977) *Sources and Effects of Ionizing Radiation* (United Nations Sales Publication E.77.IX.1), New York, United Nations
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (1982) *Ionizing Radiation: Sources and Biological Effects* (United Nations Sales Publication E.82.IX.8), New York, United Nations
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (1986) *Genetic and Somatic Effects of Ionizing Radiation* (United Nations Sales Publication E.86.IX.9), New York, United Nations
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (1988) *Sources, Effects and Risks of Ionizing Radiation. 1988 Report to the General Assembly* (United Nations Sales Publication E.88.IX.7), New York, United Nations
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (1993) *Sources and Biological Effects of Ionizing Radiation. 1993 Report to the General Assembly* (United Nations Sales Publication E.94.IX.2), New York, United Nations

- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (1994) *Sources and Effects of Ionizing Radiation, UNSCEAR 1994 Report to the General Assembly*, United Nations Sales Publication E.94.IX.11), New York, United Nations
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation) (2000) *Sources and Effects of Ionizing Radiation*, Vols I and II (United Nations Sales Publications E.00.IX.3 and E.00.IX.4), New York, United Nations
- Upton, A.C., Randolph, M.L. & Carklin, J.W. (1970) Late effects of fast neutrons and gamma-rays in mice as influenced by the dose-rate of irradiation: Induction of neoplasia. *Radiat. Res.*, **41**, 467–491
- Usenko, V., Lepekhin, E., Lyzogubov, V., Kornilovska, I., Ushakova, G. & Witt, M. (1999) The influence of low doses  $^{131}\text{I}$ -induced maternal hypothyroidism on the development of rat embryos. *Exp. Toxicol. Pathol.*, **51**, 223–227
- Van Best, J.A. (1982) Comparison of thyroid function in mice after various injected activities of  $^{123}\text{I}$ ,  $^{125}\text{I}$  and  $^{131}\text{I}$ . *Int. J. Radiat. Biol.*, **42**, 545–557
- Van Dam, F.J., Camps, J.A., Woldring, V.M., Natarajan, A.T., Van der Wall, E.E., Zwinderman, A.H., Lohman, P.H.M., Pauwels, E.K.J. & Tates, A.D. (1991) Radionuclide angiography with Tc-99m *in vivo* labeled erythrocytes does not lead to induction of mutations in the HPRT gene of human T-lymphocytes. *J. nucl. Med.*, **32**, 814–818
- Van den Heuvel, R., Schoeters, G. & Vanderborght, O. (1987) Radiosensitivity to  $^{241}\text{Am}$  of bone marrow stromal cells in offsprings of contaminated mice. In: Gerber, G.B., Métivier, H. & Smith, H., eds, *Age-related Factors in Radionuclide Metabolism and Dosimetry*, Dordrecht, Martinus Nijhoff, pp. 201–208
- Van den Heuvel, R., Gerber, G.B., Leppens, H., Vander Plaetse, F. & Schoeters, G.E.R. (1995) Long-term effects on tumour incidence and survival from  $^{241}\text{Am}$  exposure of the BALB/c mouse *in utero* and during adulthood. *Int. J. Radiat. Biol.*, **68**, 679–686
- Van den Hooff, A. (1984) The part played by the stroma in carcinogenesis. *Perspectives Biol. Med.*, **27**, 498–509
- de Vathaire, F., Schlumberger, M., Delisle, M.J., Francese, C., Challeton, C., de la Genardi  re, E., Meunier, F., Parmentier, C., Hill, C. & Sancho-Garnier, H. (1997) Leukaemias and cancers following iodine-131 administration for thyroid cancer. *Br. J. Cancer*, **75**, 734–739
- Videbaek, A. (1950) Polycythaemia vera. Course and prognosis. *Acta med. scand.*, **138**, 179–187
- Virsik, R.P., Sch  fer, C.H., Harder, D., Goodhead, D.T., Cox, R. & Thacker, J. (1980) Chromosome aberrations induced in human lymphocytes by ultrasoft Al<sub>k</sub> and C<sub>k</sub> X-rays. *Int. J. Radiat. Biol.*, **38**, 545–557
- Viswanathan, K., Gierlowski, T.C. & Schneider, A.B. (1994) Childhood thyroid cancer. Characteristics and long-term outcome in children irradiated for benign conditions of the head and neck. *Arch. Pediatr. Adolesc. Med.*, **148**, 260–265
- Voelz, G.L. & Lawrence, J.N.P. (1991) A 42-y medical follow-up of Manhattan Project plutonium workers. *Health Phys.*, **61**, 181–190
- Voelz, G.L., Lawrence, J.N.P. & Johnson, E.R. (1997) Fifty years of plutonium exposure to the Manhattan Project plutonium worker: An update. *Health Phys.*, **73**, 611–619
- Wolf, V. (1986) Chelation therapy of incorporated plutonium-238 and americium-241: Comparison of LICAM(C), DTPA and DFOA in rats, hamsters and mice. *Int. J. Radiat. Biol.*, **49**, 449–462

- Volkert, W.A., Goeckeler, W.F., Ehrhardt, G.J. & Ketrin, A.R. (1991) Therapeutic radio-nuclides: Production and decay property considerations. *J. nucl. Med.*, **32**, 174–185
- Vorobiova, M.I., Degteva, M.O., Burmistrov, D.S., Safranova, N.G., Kozheurov, V.P., Anspaugh, L.R. & Napier, B.A. (1999) Review of historical monitoring data on Techa River contamination. *Health Phys.*, **76**, 605–618
- Vulpis, N. (1984) The induction of chromosome aberrations in human lymphocytes by *in vitro* irradiation with  $\beta$  particles from tritiated water. *Radiat. Res.*, **97**, 511–518
- Wada, I., Horiuchi, H., Mori, M., Ishikawa, Y., Fukumoto, M., Mori, T., Kato, Y., Kitagawa, T. & Machinami, R. (1999) High rate of small TP53 mutations and infrequent loss of heterozygosity in malignant liver tumors associated with Thorotrast: Implications for alpha-particle carcinogenesis. *Radiat. Res.*, **152**, S125–S127
- Wagoner, J.K., Archer, V.E., Carroll, B.E., Holaday, D.A. & Lawrence, P.A. (1964) Cancer mortality patterns among US uranium miners and millers, 1950 through 1962. *J. natl Cancer Inst.*, **32**, 787–801
- Wagoner, J.K., Arvher, V.E., Lundin, F.E., Jr, Holaday, D.A. & Lloyd, J.W. (1965) Radiation as the cause of lung cancer among uranium miners. *New Engl. J. Med.*, **273**, 181–188
- Walinder, G. (1972) Late effects of irradiation on the thyroid gland in mice. I. Irradiation of adult mice. *Acta radiol. ther. phys. biol.*, **11**, 433–451
- Walinder, G. & Rönnbäck, C. (1984) Neoplastic effects after prenatal irradiation. In: *Effects of Prenatal Irradiation with Special Emphasis on Late Effects* (EUR-8067), Luxembourg, Commission of the European Communities, pp. 101–115
- Walinder, G. & Sjödén, A.-M. (1972) Late effects of irradiation on the thyroid gland in mice. II. Irradiation of mouse foetuses. *Acta radiol. ther. phys. biol.*, **11**, 577–589
- Walinder, G. & Sjödén, A.-M. (1973) Late effects of irradiation on the thyroid gland in mice. III. Comparison between irradiation of foetuses and adults. *Acta radiol. ther. phys. biol.*, **12**, 201–208
- Wang, B. & Zhou, X.-Y. (1995) Effects of prenatal exposure to low-dose  $\beta$  radiation from tritiated water on the neurobehavior of mice. *J. Radiat. Res.*, **36**, 103–111
- Ward, J.F. (1994) The complexity of DNA damage: Relevance to biological consequences. *Int. J. Radiat. Biol.*, **66**, 427–432
- Watanabe, N., Yokoyama, K., Kinuya, S., Shuke, N., Shimizu, M., Futatsuya, R., Michigishi, T., Tonami, N., Seto, H. & Goodwin, D.A. (1998) Radiotoxicity after iodine-131 therapy for thyroid cancer using the micronucleus assay. *J. nucl. Med.*, **39**, 436–440
- Watson, G.E., Lorimore, S.A. & Wright, E.G. (1996) Long-term *in vivo* transmission of  $\alpha$ -particle-induced chromosomal instability in murine haemopoietic cells. *Int. J. Radiat. Biol.*, **69**, 175–182
- Waxweiler, R.J., Archer, V.E., Roscoe, R.J., Watanabe, A. & Thun, M.J. (1983) Mortality patterns among a retrospective cohort of uranium mill workers. In: *Epidemiology Applied to Health Physics, Proceedings of the 16th Mid-year Topical Meeting of the Health Physics Society, Albuquerque, NM, January 9–13*, McLean, VA, Health Physics Society, pp. 428–435
- Wegener, K., Hasenohrl, K. & Wesch, H. (1983) Recent results of the German Thorotrast study — Pathoanatomical changes in animal experiments and comparison to human thorotrastosis. *Health Phys.*, **44** (Suppl. 1), 307–316
- Weiner, R.E., McInroy, J.F. & Wegst, A.V. (1985) Determination of environmental levels of Pu, Am, U and Th in human fetal tissue (Abstract). *Health Phys.*, **49**, 141

- Weiss, E.S., Olsen, R.E., Thompson, G.D.C. & Masi, A.T. (1967) Surgically treated thyroid disease among young people in Utah, 1948–1962. *Am. J. public Health*, **57**, 1807–1814
- Weiss, E.S., Rallison, M.L., London, W.T. & Thompson, G.D.C. (1971) Thyroid nodularity in southwestern Utah school children exposed to fallout radiation. *Am. J. public Health*, **61**, 241–249
- Weller, R.E., Buschbom, R.L., Park, J.F., Dagle, G.E. & Ragan, H.A. (1995a) Hematological effects of inhaled plutonium dioxide in beagles. *Radiat. Res.*, **143**, 69–76
- Weller, R.E., Dagle, G.E., Buschbom, R.L. & Park, J.F. (1995b) Examination of testicular tumours in the beagle dog exposed to inhaled plutonium. *Int. J. Radiat. Biol.*, **68**, 63–70
- Weller, R.E., Buschbom, R.L., Dagle, G.E., Ragan, H.A. & Park, J.F. (1995c) Hepatic effects of inhaled plutonium dioxide in beagles. *Radiat. Res.*, **144**, 73–81
- Welleweerd, J., Wilder, M.E., Carpenter, S.G. & Raju, M.R. (1984) Flow cytometric determination of radiation-induced chromosome damage and its correlation with cell survival. *Radiation Res.*, **99**, 44–51
- Werner, S.C., Hamilton, H. & Nemeth, M.R. (1952) Therapeutic effects from repeated diagnostic doses of I<sup>131</sup> in adult and juvenile hyperthyroidism. *J. clin. Endocrinol.*, **12**, 1349–1355
- Wesch, H., van Kaick, G., Riedel, W., Kaul, A., Wegener, K., Hasenöhrl, K., Immich, H. & Muth, H. (1983) Recent results of the German Thorotrast study — Statistical evaluation of animal experiments with regard to the nonradiation effects in human thorotrustosis. *Health Phys.*, **44** (Suppl. 1), 317–321
- Wesch, H., Riedel, W., Hasenöhrl, K., Wegener, K., Kaul, A., Muth, H. & van Kaick, G. (1986) German Thorotrast study: Results of the long-term animal studies on the effect of incorporated radioactive and nonradioactive particles. In: Gössner, W., Gerber, G.B., Hagen & U., Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 186–188
- Whaley, J.M. & Little, J.B. (1990) Efficient mutation induction by <sup>125</sup>I and <sup>131</sup>I decays in DNA of human cells. *Radiat. Res.*, **123**, 68–74
- Whaley, J.M., Kassis, A.I., Kinsey, B.M., Adelstein, S.J. & Little, J.B. (1990) Mutation induction by <sup>125</sup>iidoacetylproflavine, a DNA-intercalating agent, in human cells. *Int. J. Radiat. Biol.*, **57**, 1087–1103
- Whicker, F.W., Kirchner, T.B., Anspaugh, L.R. & Ng, Y.C. (1996) Ingestion of Nevada Test Site fallout: Internal dose estimates. *Health Phys.*, **71**, 477–486
- White, R.G., Raabe, O.G., Culbertson, M.R., Parks, N.J., Samuels, S.J. & Rosenblatt, L.S. (1993) Bone sarcoma characteristics and distribution in beagles fed strontium-90. *Radiat. Res.*, **136**, 178–189
- White, R.G., Raabe, O.G., Culbertson, M.R., Parks, N.J., Samuels, S.J. & Rosenblatt, L.S. (1994) Bone sarcoma characteristics and distribution in beagles injected with radium-226. *Radiat. Res.*, **137**, 361–370
- Whitehouse, C.A., Tawn, E.J. & Riddell, A.E. (1998) Chromosome aberrations in radiation workers with internal deposits of plutonium. *Radiat. Res.*, **150**, 459–468
- WHO (1982) Histological typing of lung tumours. *Am. J. clin. Pathol.*, **77**, 123–136
- Wichmann, H.E., Kreienbrock, L., Kreuzer, M., Gerken, M., Dingerkus, G., Wellmann, J. & Keller, G. (1998a) *Lungenkrebsrisiko durch Radon in der Bundesrepublik Deutschland (West)* [Risk for Lung Cancer from Radon in Western Germany], Landsberg, Ecomed Verlagsgesellschaft

- Wichmann, H.E., Kreienbrock, L., Kreuzer, M., Gerken, M., Dingerkus, G., Wellmann, J., Keller, G. & Kappel, R. (1998b) Results of the western German case-control study on indoor radon and lung cancer in the context of other epidemiological studies. In: *Radiation Protection 98, Scientific Seminar on Radiation Protection in Relation to Radon*, Luxembourg, Commission of the European Communities
- Wichmann, H.E., Gerken, M., Wellmann, J., Kreuzer, M., Kreienbrock, L., Keller, G., Wölke, G. & Heinrich, J. (1999) *Lungenkrebsrisiko durch Radon in der Bundesrepublik Deutschland (Ost) — Thüringen und Sachsen [Risk for Lung Cancer from Radon in Eastern Germany — Thuringia and Saxony]*, Landsberg, Ecomed Verlagsgesellschaft
- Wick, R.R. & Gössner, W. (1983) Follow-up study of late effects in  $^{224}\text{Ra}$  treated ankylosing spondylitis patients. *Health Phys.*, **44**, 187–195
- Wick, R.R. & Gössner, W. (1993) History and current uses of  $^{224}\text{Ra}$  in ankylosing spondylitis and other diseases. *Environ. int.*, **19**, 467–473
- Wick, R.R., Chmelevsky, D. & Gössner, W. (1986)  $^{224}\text{Ra}$ : Risk to bone and haematopoietic tissue in ankylosing spondylitis patients. In: Gössner, W., Gerber, G.B., Hagen, U. & Luz, A., eds, *The Radiobiology of Radium and Thorotrast*, Munich, Urban & Schwarzenberg, pp. 38–44
- Wick, R.R., Nekolla E.A., Gössner, W. & Kellerer, A.M. (1999) Late effects in ankylosing spondylitis patients treated with  $^{224}\text{Ra}$ . *Radiat. Res.*, **152**, S8–S11
- Wiethege, T., Wesch, H., Wegener, K., Müller, J.-M., Mehlhorn, J., Spiethoff, A., Schömig, D., Hollstein, M., Bartsch, H. & the German Uranium Miner Study, Research Group Pathology (1999) German uranium miner study — Pathological molecular genetic findings. *Radiat. Res.*, **152**, S52–S55
- Wiggs, L.D., Cox-DeVore, C.A. & Voelz, G.L. (1991) Mortality among a cohort of workers monitored for  $^{210}\text{Po}$  exposure: 1944–1972. *Health Phys.*, **61**, 71–76
- Wiggs, L.D., Johnson, E.R., Cox-DeVore, C.A. & Voelz, G.L. (1994) Mortality through 1990 among white male workers at the Los Alamos National Laboratory: Considering exposures to plutonium and external ionizing radiation. *Health Phys.*, **67**, 577–588
- Wiklund, K., Holm, L.-E. & Eklund, G. (1990) Cancer risks in Swedish Lapps who breed reindeer. *Am. J. Epidemiol.*, **132**, 1078–1082
- Wiklund, K., Holm, L.-E. & Eklund, G. (1991) Mortality among Swedish reindeer breeding Lapps in 1961–85. *Arctic med. Res.*, **50**, 3–7
- Wiley, L.M., Raabe, O.G., Khan, R. & Straume, T. (1994) Radiosensitive target in the early mouse embryo exposed to very low doses of ionizing radiation. *Mutat. Res.*, **309**, 83–92
- Wilkinson, G.S., Tietjen, G.L., Wiggs, L.D., Galke, W.A., Acquavella, J.F., Reyes, M., Voelz, G.L. & Waxweiler, R.J. (1987) Mortality among plutonium and other radiation workers at a plutonium weapons facility. *Health Phys.*, **125**, 231–250
- Williams, E.D. (1996) Editorial: Thyroid cancer and the Chernobyl accident. *J. clin. Endocrinol. Metab.*, **81**, 6–8
- Williams, E.D., Cherstvoy, E., Egloff, B., Hofler, H., Vecchio, G., Bogdanova, T., Bragarnik, M. & Tronko, N.D. (1996) Interaction of pathology and molecular characterization of thyroid cancers. In: Karaoglu, A., Desmet, G., Kelly, G.N. & Menzel, H.G., eds, *The Radiological Consequences of the Chernobyl Accident. Proceedings of the First International Conference, Minsk, Belarus, 18 to 22 March 1996* (EUR 16544 EN), Luxembourg, Office for Official Publications of the European Commission, pp. 699–714

- Wilson, A.R. & Spiers, F.W. (1967) Fallout caesium-137 and potassium in newborn infants. *Nature*, **215**, 470–474
- Withers, H.R. (1986) Predicting late normal tissue responses. *Int. J. Radiat. Oncol. Biol. Phys.*, **12**, 693–698
- Withers, H.R. (1989) Failla memorial lecture. Contrarian concepts in the progress of radiotherapy. *Radiat. Res.*, **119**, 395–412
- Wolff, S.P. (1991) Leukaemia risks and radon (Letter to the Editor). *Nature*, **352**, 288
- Wones, R., Radack, K., Martin, V., Mandell, K., Pinney, S. & Buncher, R. (1995) Do persons living near a uranium processing site have evidence of increased somatic cell gene mutations? A first study. *Mutat. Res.*, **335**, 171–184
- Wood, J.W., Tamagaki, H., Neriishi, S., Sato, T., Sheldon, W.F., Archer, P.G., Hamilton, H.B. & Johnson, K.G. (1969) Thyroid carcinoma in atomic bomb survivors. Hiroshima and Nagasaki. *Am. J. Epidemiol.*, **89**, 4–14
- Woodward, A., Roder, D., McMichael, A.J., Crouch, P. & Mylvaganam, A. (1991) Radon daughter exposures at the Radium Hill uranium mine and lung cancer rates among former workers, 1952–87. *Cancer Causes Control*, **2**, 213–220
- Wrenn, M.E., Durbin, P.W., Howard, B., Lipsztein, J., Rundo, J., Still, E.T. & Willis, D.L. (1985) Metabolism of ingested U and Ra. *Health Phys.*, **48**, 601–633
- Wrenn, M.E., Singh, N.P., Ruth, H., Rallison, M.L. & Burleigh, D.P. (1989) Gastrointestinal absorption of soluble uranium from drinking water by man. *Radiat. Prot. Dosim.*, **26**, 119–122
- Wu, L.-J., Randers-Pehrson, G., Xu, A., Waldren, C.A., Geard, C.R., Yu, Z.-L. & Hei, T.K. (1999) Targeted cytoplasmic irradiation with alpha particles induces mutations in mammalian cells. *Proc. natl Acad. Sci USA*, **96**, 4959–4964
- Xu, Z.-Y., Blot, W.J., Xiao, H.-P., Wu, A., Feng, Y.-P., Stone, B.J., Sun, J., Ershow, A.G., Henderson, B.E. & Fraumeni, J.F., Jr (1989) Smoking, air pollution and the high rates of lung cancer in Shenyang, China. *J. natl Cancer Inst.*, **81**, 1800–1806
- Xuan, X.-Z., Lubin, J.H., Li, J.-Y., Yang, L.-F., Sheng, L.Q., Lan, Y., Wang, J.-Z. & Blot, W.J. (1993) A cohort study in southern China of tin miners exposed to radon and radon decay products. *Health Phys.*, **64**, 120–131
- Yachmenyov, V.A. & Isageva, L.W. (1996) Environmental monitoring in the vicinity of the Mayak atomic facility. *Health Phys.*, **71**, 61–70
- Yakushina, V.I., Ivanov, A.E., Kirillov, S.A., Kurshakova, N.N., Mordasheva, V.V., Severin, S.F. & Drutman, R.D. (1972) [A case of lung cancer in a female worker of the plutonium plant.] *Bull. Radiat. Med.*, **2**, 29–40 (in Russian)
- Yamada, T., Yukawa, O., Asami, K., & Nakazawa, T. (1982) Effect of chronic HTO  $\beta$  or  $^{60}\text{Co}$   $\gamma$  radiation on preimplantation mouse development *in vitro*. *Radiat. Res.*, **92**, 359–369
- Yamaguchi, T., Yasukawa, M., Terasima, T. & Matsudaira, H. (1989) Induction of malignant transformation in mouse 10T1/2 cells by low-dose-rate exposure to tritiated water and gamma-rays at two different temperatures, 4 °C and 37 °C. *J. Radiat. Res.*, **30**, 112–121
- Yamamoto, O., Yokoro, K., Seyama, T., Kinomura, A. & Nomura, T. (1990) HTO oral administration in mice. I: Threshold dose rate for haematopoietic death. *Int. J. Radiat. Biol.*, **57**, 543–549

- Yamamoto, O., Seyama.T., Jo, T., Terato, H., Saito, T. & Kinomura, A. (1995) Oral administration of tritiated water (HTO) in mouse. II. Tumour development. *Int. J. Radiat. Biol.*, **68**, 47–54
- Yamamoto, O., Seyama, T., Itoh, H. & Fujimoto, N. (1998) Oral administration of tritiated water (HTO) in mouse. III: Low dose-rate irradiation and threshold dose-rate for radiation risk. *Int. J. Radiat. Biol.*, **73**, 535–541
- Yao, S.-X., Lubin, J.H., Qiao, Y.L., Boice, J.D., Jr, Li, J.-Y., Cai, S.-K., Zhang, F.-M. & Blot, W.J. (1994) Exposure to radon progeny, tobacco use and lung cancer in a case-control study in southern China. *Radiat. Res.*, **138**, 326–336
- Yngveson, A., Williams, C., Hjerpe, A., Lundeberg, J., Söderkvist, P. & Pershagen, G. (1999) *p53* mutations in lung cancer associated with residential radon exposure. *Cancer Epidemiol. Biomarkers Prev.*, **8**, 433–438
- Young, R.W. (1987) Acute radiation syndrome. In: Conklin, J.J. & Walker, R.I., eds, *Military Radiobiology*, New York, Academic Press, pp. 165–190
- Zaire, R., Griffin, C.S., Simpson, P.J., Papworth, D.G., Savage, J.R.K., Armstrong, S. & Hulten, M.A. (1996) Analysis of lymphocytes from uranium miners in Namibia for chromosomal damage using fluorescence in situ hybridization (FISH). *Mutat. Res.*, **371**, 109–113
- Zaire, R., Notter, M., Riedel, W. & Thiel, E. (1997) Unexpected rates of chromosomal instabilities and alterations of hormone levels in Namibian uranium miners. *Radiat. Res.*, **147**, 579–584
- Zakharova, M.L., Uriadnitskaia, T.I., Sokhranich, A.L., Revina, V.S. & Nifatov, A.P. (1988) [Frequency of structural chromosome aberrations in the hepatocytes of rats exposed to polymeric  $^{239}\text{Pu}$ .] *Radiobiologiya*, **28**, 752–755 (in Russian)
- von Zallinger, C. & Tempel, K. (1998) Transplacental transfer of radionuclides. A review. *J. vet. Med. A*, **45**, 581–590
- Zamenhof, S. & van Marthens, E. (1979) The effects of chronic ingestion of tritiated water on prenatal brain development. *Radiat. Res.*, **77**, 117–127
- Zamenhof, S. & van Marthens, E. (1981) The effects of pre- and postnatal exposure to tritiated water for five generations on postnatal brain development. *Radiat. Res.*, **85**, 292–301
- Zanzonico, P.B. & Becker, D.V. (1992) Radiation hazards in children born to mothers exposed to 131-iodine. In: Beckers, C. & Reinwein, D., eds, *The Thyroid and Pregnancy*, New York, John Wiley, pp. 189–202
- Zivanovic, M.A., McCready, V.R. & Taylor, D.M. (1979) The urinary excretion of gallium-67 citrate in patients with neoplastic disease. *Eur. J. nucl. Med.*, **4**, 277–282
- Zúñiga-González, S. (2000) [Thyroiditis following treatment with radioiodine ( $^{131}\text{I}$ )]. Case report and review of the literature.] *Gac. Méd. Méx.*, **136**, 65–69 (in Spanish)