

**Clatterbridge Centre for Oncology Physics Department
Summary of Research Output 2009**

Papers in peer - reviewed research journals

Aarup L R, Nahum A E, Zacharatou Jarlskog C, Juhler-Nøttrup T, Knöös T, Nyström H, Specht L, Wieslander E, and Korreman S S., The effect of different lung densities on the accuracy of various radiotherapy dose calculation methods: Implications for tumour coverage *Radiotherapy&Oncology* **91** 405-14 2009.

Iori M, Paiusco M, Cagni E, Riccardi S, Lambertini D, Bizzocchi N, Borasi G, Iotti C, D'Abbiere N, Nahum A E, The Intensity Modulated Arc Therapy (IMMA) technique: forward & inverse planned procedures to deliver hypo-fractionated IMAT treatments. *Current Radiopharmaceuticals* **2** 149-159 2009.

Fenwick J D, Nahum A E, Malik Z I, Eswar C V, Hatton M Q, Lawrence V, Lester J F and Landau D B, Escalation and intensification of radiotherapy for stage III non-small cell lung cancer: Opportunities for treatment improvement. *Clin. Oncol.* **21** 343-60 2009.

Scott A J D, Nahum A E and Fenwick J D, Monte Carlo modeling of small photon fields: quantifying the impact of focal spot size on source occlusion and output factors, and exploring miniphantom design for small-field measurements *Medical Physics* **36** 3132-3144 2009.

Mauro Iori, Elisabetta Cagni, Marta Paiusco, Peter Munro, Giovanni Borasi, Alan E. Nahum. Dosimetric verifications of IMAT delivery with a conventional EPID system and a commercial portal dose image prediction tool. Accepted for publication in *Medical Physics* May 2009.

Pardo-Montero J, Fenwick JD. An approach to multiobjective optimisation of rotational therapy. *Medical Physics* **36** 3292-3303 2009

Kacperek, A. Protontherapy of eye tumours in the UK: A review of treatment at Clatterbridge. *Applied Radiation and Isotopes*, Volume 67, Issue 3, March 2009, Pages 378-386. Proceedings of the first international conference on biomedical applications of high energy ion beams.

C.R. Baker, T.E. Quine, J.N.H. Brunt, A. Kacperek. Monte Carlo simulation and polymer gel dosimetry of 60 MeV clinical proton beams for the treatment of ocular tumours. *Applied Radiation and Isotopes*, Volume 67, Issue 3, March 2009, Pages 402-405.

S. Al-Nowais, S. Doran, A. Kacperek, N. Krstajic, J. Adamovics, D. Bradley. A preliminary analysis of LET effects in the dosimetry of proton beams using PRESAGE™ and optical CT. *Applied Radiation and Isotopes*, Volume 67, Issue 3, March 2009, Pages 415-418.

V.Panettieri, P.Barsoum, M.Westermark, L.Brualla, I.Lax " AAA and PBC calculation accuracy in the surface build-up region in tangential beam treatments. Phantom and Breast case study with the Monte Carlo code PENELOPE" *Radiotherapy and Oncology* **93** 94-101 2009.

Other Publications

Doyle, M and Kacperek, A. Clinical Cyclotrons: treating eye tumours with proton beams'. *SYNERGY* May 2009 pp. 24-27. ISSN 1360-5518.

Book Chapters

Nahum A.E. "Cavity Theory, Stopping-Power Ratios, Correction Factors", Chapter 3 in *Clinical Dosimetry Measurements in Radiotherapy*, Editors DWO Rogers and Joanna E Cygler, AAPM 2009 Summer School Proceedings, Medical Physics Publishing, Madison, WI. (ISBN 978-1-888340-84-6).

Invited lectures

ESTRO PREVENT (Prediction, Recognition, Evaluation and Eradication of Normal Tissue Effects), January 11-12 2009, Brussels, invited talk by Alan Nahum: *MODELS FOR NORMAL TISSUE COMPLICATION PROBABILITY – HOW TO USE THEM IN CLINICAL RADIOTHERAPY*

AAPM Summer School 2009, Topic: "Clinical dosimetry for radiotherapy", 21-25 June 2009, Colorado College, Colorado Springs; invited lecture by Alan Nahum: *Cavity Theory, Stopping-Power Ratios, Correction Factors*.

Irish Radiation Research Society Scientific Meeting 2009, 16-17 October 2009, Galway, Ireland, invited talk "Radiobiologically Optimised Radiotherapy" by Alan Nahum.

Courses organised

Radiobiology & Radiobiological Modelling in Radiotherapy, 28 April – 1 May 2009, Chester UK.

Clatterbridge Centre for Oncology staff gave the following lectures:

- OVERVIEW of RADIOBIOLOGY from a CLINICAL ONCOLOGY PERSPECTIVE, Isabel Syndikus, consultant in Clinical Oncology
- INDUCTION of (SECOND) CANCERS by RADIOTHERAPY, Geoff Lawrence, Head of Imaging Physics
- RADIOBIOLOGICAL ASPECTS of HEAVY-PARTICLE THERAPY, Andrzej Kacperek, Chief Physicist, Douglas Cyclotron Unit
- INTRODUCTION to 'BIOLOGICAL' MODELS in RADIOTHERAPY, Alan Nahum
- MODELLING TUMOUR CONTROL PROBABILITY (TCP), Alan Nahum
- STATISTICAL METHODS USED in DOSE-VOLUME ANALYSES, John Fenwick, (also at School of Cancer Studies, Liverpool University)
- APPLICATIONS of TCP MODELLING, Alan Nahum
- BIOMATHEMATICAL MODELLING – *from the drawing board to the clinic*, Chinnamani Eswar, consultant in Clinical Oncology.

- DELAY-DIFFERENTIAL EQUATIONS and the DOSE-TIME DEPENDENCE of EARLY RADIOTHERAPY REACTIONS, John Fenwick.
- ACHIEVING CLINICAL ACCEPTANCE of RADIOBIOLOGICALLY-BASED TREATMENT PLANS, Philip Mayles, Head of Physics Department.

Software written by Clatterbridge Centre for Oncology researchers

LQ-survivor (Julien Uzan), issued April 2009

BioSuite (Julien Uzan), issued April 2009

New version (v3.05) of the *EyePlan* ocular radiotherapy treatment planning program (Martin Sheen) issued 27/3/09

Abstracts (published)

Nahum A E, Models for Normal Tissue Complication Probability: How to use them in Clinical Radiotherapy, *Radioth. Oncol.* **90 (Supplement 1)** S5 2009

Rutkowska E, Baker C and Nahum A E, Insights into Normal Tissue Response to Irradiation gained from a Quasi-mechanistic Computer Model, *Radioth. Oncol.* **90 (Supplement 1)** S25 2009

Nahum A E, Ruggieri R, Chapman J D, Uses and Abuses of the Linear-Quadratic Model in Interpreting and Predicting Clinical Radiotherapy Outcomes, *Radioth. Oncol.* **90 (Supplement 3)** S95 2009

Proffered Oral Presentations

Nahum A E, Ruggieri R, Chapman J D, "Uses and Abuses of the Linear-Quadratic Model in Interpreting and Predicting Clinical Radiotherapy Outcomes", Oral presentation at ICTR 2009 (Fourth International Conference on Translational Research and Pre-Clinical Strategies in Radiation Oncology), March 11-13, 2009, Geneva.

V.Panettieri, P.Barsoum, M. Westermarck, I.Lax "Migration from a pencil beam convolution algorithm to a convolution-superposition algorithm in SBRT of lung tumours: MC study", ISRS meeting 2009, Seoul, South Korea.

Scott AJD, Nahum AE, Fenwick JD.

"Modelling and measuring small radiotherapy photon fields"

10th Biennial ESTRO conference on Physics and Radiation Technology for Clinical Radiotherapy, 30 Aug.- 3 Sept., Maastricht.

Scott AJD, Nahum AE, Fenwick JD.

"Modelling and measuring small radiotherapy photon fields"

IPEM annual scientific meeting, 14-16 September 2009, Liverpool.

Uzan J, Nahum A E, Eswar C, Malik Z.

"BioSuite – software for radiobiological customisation of dose and fraction size in external-beam radiotherapy"

IPEM annual scientific meeting, 14-16 September 2009, Liverpool.

Panettieri V, Fenwick J, Malik Z, Eswar C, Nahum AE.

"MC-based quality assurance of radiobiologically optimized lung tumour radiotherapy treatments"

MCTP2009 – Second European Workshop on Monte Carlo Treatment Planning, 19-21 October 2009, Cardiff.

I.Smith, C.Baker, V.Panettieri, C.Addison, AE Nahum “Implementing a MC based treatment plan QA on Grid-enabled High Performance Computing cluster, MCTP2009 – Second European Workshop on Monte Carlo Treatment Planning, 19-21 October 2009, Cardiff.

Chris. D. Lee, Louise Gately, John N. H. Brunt, Khizar Hayat, Aileen Flavin
Retrospective analysis of 5 patients treated with the CT/MR compatible Ring and Tandem applicator between 2001 and 2005
IPEM meeting “BRACHYTHERAPY: THE MODERN ERA”, 24th November 2009, Manchester Dental Education Centre.

Louise Gately, Chris. D. Lee
Comparison of 3D image guided brachytherapy (IGBT) dose volume histograms (DVHs) calculated by three treatment planning systems (TPS)
IPEM meeting “BRACHYTHERAPY: THE MODERN ERA”, 24th November 2009, Manchester Dental Education Centre.

Preferred Posters

Rutkowska E, Baker C and Nahum A E, “Insights into Normal Tissue Response to Irradiation gained from a Quasi-mechanistic Computer Model” Poster presented at ESTRO PREVENT (Prediction, Recognition, Evaluation and Eradication of Normal Tissue Effects) conference, January 11-12 2009, Brussels

Aarup L, Zacharatou C, Persson G F, Brink C, Nahum A E, Specht L, Korreman SS
“Lung sparing and tumour coverage in 4D CT based lung treatment planning: a comparison between Monte Carlo, pencil beam and AAA on selecting the optimal phase for treatment delivery”.
10th Biennial ESTRO conference on Physics and Radiation Technology for Clinical Radiotherapy, 30 Aug.- 3 Sept., Maastricht.

Baker C, Nahum A E and Rutkowska E
“Factors influencing the association between V_x and the complication rate”
10th Biennial ESTRO conference on Physics and Radiation Technology for Clinical Radiotherapy, 30 Aug.- 3 Sept., Maastricht.

Stavrev P, Stavreva N, Nahum A E
“Survival curve estimates of cellular radiosensitivity, what do they represent?”
10th Biennial ESTRO conference on Physics and Radiation Technology for Clinical Radiotherapy, 30 Aug.- 3 Sept., Maastricht.

Uzan J, Eswar C, Malik Z, Nahum A E
“BioSuite, new software for radiobiological customisation for dose and fraction size in EBRT”
10th Biennial ESTRO conference on Physics and Radiation Technology for Clinical Radiotherapy, 30 Aug.- 3 Sept., Maastricht.

Miscellaneous

Alan Nahum is a contributor to and co-Editor of *PHYSICS CORNER* in the ESTRO members' magazine (published 4 times a year)