Basic Clinical Radiobiology

**The faculty**

There are 6 teachers; 4 biologists (Bert van der Kogel (Course director), Mike Joiner (originally a physicist), Wolfgang Dörr, Marianne Koritzinsky (alternates with Brad Wouters)) and 2 radiation oncologists with extensive laboratory/experimental experience (Vincent Gregoire, Marianne Nordsmark). Marianne N and Marianne K joined the course in 2009; the other teachers have been on the course for many years. The expertise of the teachers covers a wide range of specialist topics, including biophysics and modeling (Mike and Bert), normal tissue damage (Wolfgang and Bert) molecular signaling and responses (Marianne K /Brad) and clinical radiation oncology (Vincent and Marianne N). There are not usually any guest lecturers on the course.

This is a very popular course and it is often run twice per year, once in Europe and once outside Europe. The commitment and enthusiasm of the teachers is therefore especially commendable!

**Program structure**

The title adequately describes the program.

There is an attractive mix of lectures (29), general discussions and clinical questions (4), calculations for changes in dose prescription according to LQ concepts (1) and clinical examples based on real situations (2).

The structure and build up of the program look good. The first morning starts with introduction lectures on “Importance of radiobiology in the clinic”, “Hallmarks of cancer”, “Molecular basis of cell death”, “Measurement of cell survival”, and “Models of radiation killing”. In the afternoon there are lectures on “LET and RBE”, “Quantification of normal tissue damage in the clinic”, “Pathogenesis of normal tissue damage”. The second day focuses on the LQ approach to fractionation, with lectures on the influence of fraction size, overall treatment time, non-standard fractionation in clinical practice and how to apply the LQ formulations for calculating and adapting schedules to maintain the desired tumor dose without exceeding normal tissue tolerance. There is also a lecture on “Molecular basis of radiation responses” as light relief from fractionation and calculations! The third morning is devoted to the oxygen effect, tumor microenvironment and clinical consequences in radiotherapy. The afternoon session covers “Dose response relationships in radiotherapy” and “Volume effects”. There is also a workshop with clinical examples. The fourth day starts with lectures on “Image guided radiotherapy”, “Biological response modifiers” and “Dose rate effects”. In the afternoon there are lectures on “Combined chemoradiotherapy” and re-treatment tolerance”, followed by a workshop with clinical examples relating to these topics.
The final day covers “Particle therapy”, “Radiation-induced malignancies” “Tumor growth and response to radiation” and two further lectures on biological response modifiers (clinical application and normal tissue effects).

This program is attractive and well balanced, with a good mix of classical radiobiology, latest technical and molecular developments and clinical application. It might be advantageous to reorder the program slightly, e.g. putting the tumor growth lecture (which is quite basic) earlier in the course and bringing the mechanisms and clinical application of biological modifiers lectures closes together. However, teacher availability sometimes limits these options.

The course material is excellent. There is some overlap with lectures on the Molecular oncology for the radiation oncologist course. Lectures on “Hallmarks of Cancer” and “Mechanisms of cell death” are very similar. (Note: these lectures were originally developed by Brad Wouters for use on both courses). There is also some overlap in the following topics (but the level of detail and material used are different): “DNA damage response and repair”, “Molecular response to hypoxia”, “Biological targeting” and “Molecular imaging”. There are no conflicting messages or inconsistencies between the two courses.

Educational methods
A variety of teaching methods are used: lectures, general discussions, calculations, workshops on clinical examples.

Target Group
The course participants were radiation oncologists or trainees (68%), physicists or trainees (20%), biologists or RTTs (11%). Only 6 of the participants had previously attended the “Molecular oncology for the radiation oncologist” course, but 19 had attended the “Evidence based” course, 17 had attended the “Physics” course and others had attended various other clinical ESTRO courses.

References:
Boag JW (1975). The time scale in radiobiology. 12th Failla memorial lecture. In:  


