

Press release

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Department of: Clinical Medicine

Main supervisor: Associate professor Brita Singers Sørensen

Title of dissertation:

Differential regulation of the biological response to proton and photon beam irradiation

Date of defence: Friday the 23rd of November 2018. **Time:** 14:00-16.00. **Place:** Medicinsk Auditorium, Bygning 3, Aarhus Universitetshospital, Nørrebrogade 44, 8000 Aarhus C.

Inflammatoriske processer reguleres forskelligt af protonstråling og røntgenstråling

Protonterapi til behandling af kræftpatienter er blevet en mere udbredt form for strålebehandling. I starten af 2019 vil protonterapi også blive anvendt i Danmark. Protoner har en mere favorabel dosisafsættelse i vævet end de almindeligt anvendte røntgenstråler. Derved kan man opnå en mere konform dosislevering til tumoren, mens det omkringliggende normalvæv skånes mere effektivt. De patienter som potentielt har gavn af protonterapi forventes at have mindre risiko for at udvikle smertefulde og belastende normalvævsskader, som nedsætter livskvaliteten. Røntgenstråling aktiverer og inhiberer en lang række forskellige biologiske processer i celler og væv, hvilket bidrager til udviklingen af normalvævsskader. Målet med dette Ph.d.-projekt var at undersøge, hvordan protonstråling påvirker biologiske processer og sammenligne med påvirkningen af røntgenstråling, da differentiell regulering af nogle processer potentielt kunne have indflydelse på udvikling af normalvævsskader.

Vi har udført omfattende celle- og dyreforsøg, der har demonstreret, at faktorer afgørende for regulering af inflammatoriske processer udtrykkes forskelligt efter stråling med protoner og fotoner. Inflammatoriske processer er særligt relevante, da de er centrale i udviklingen af stråleinducerede senskader. Dette indikerer, at proton- og røntgenstråling ikke nødvendigvis vil medføre samme grad af bivirkninger i det bestrålede væv, men fremtidige studier er nødvendige for at afgøre, om der er en klinisk relevant effekt.

Projektet er støttet af Kræftens Bekæmpelse, A.P Møllers fond for lægevidenskabens fremme og Dansk Kræftforskningsfond.

Forsvaret af ph.d.-projektet er offentligt og finder sted den 23/11 kl. 14 i medicinsk auditorium, Aarhus Universitetshospital, Nørrebrogade 44, 8000 Aarhus C. Titlen på projektet er "Differential regulation of the biological response to proton and photon beam irradiation".

Yderligere oplysninger: Ph.d.-studerende Steffen Nielsen, e-mail steffen.nielsen@oncology.au.dk, tlf. 40922039

Bedømmelsesudvalg:

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Press release (English)

Inflammatory processes are regulated differently by proton and X-ray radiation

Proton radiation therapy is becoming more widely available in cancer treatment. In the beginning of 2019, proton therapy will also be offered in Denmark. Protons have a more favourable dose deposition in the tissue than conventional X-rays. Therefore, a more conformal dose delivery to the tumour can be achieved with improved sparing of the surrounding normal tissue. The patients with a potential benefit of proton beam therapy are expected to have a reduced risk of developing painful and disabling normal tissue complications that reduce the quality of life considerably. X-ray radiation activates and inhibits a range of different biological processes in cells and tissues, which contribute to the development of normal tissue damage. The aim of this PhD project was to investigate how proton radiation affects biological processes in comparison with X-rays as differential regulation of certain biological processes could influence the development of normal tissue complications.

We have demonstrated both in cell and animal experiments that factors important for regulation of inflammatory processes are expressed differently after irradiation using protons and photons. Inflammatory processes are especially relevant as they have a critical role in the development of radiation-induced late normal tissue damages. These findings indicate that proton and X-ray radiation may not induce the same degree of side effects in the irradiated tissue, however future studies are necessary to determine if there is a clinically relevant effect.

The project is supported by the Danish Cancer Society, the A.P. Møller Fund for the Advancement of Medical Science, and the Danish Cancer Research Fund.

The defence is public and takes place on the 23rd of November 2018 at 14:00 o'clock in Medical Auditorium, Building 3, Aarhus University Hospital, Nørrebrogade 44, 8000 Aarhus C, Denmark. The project title is "Differential regulation of the biological response to proton and photon beam irradiation". For more information, please contact: PhD student Steffen Nielsen, email: steffen.nielsen@oncology.au.dk Phone +45 4092 2039

Members of the assessment committee

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