

ITRF: Background, Science Case

Karen Kirkby,
University of Manchester, The Christie NHS Foundation Trust

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ITRF Kickoff Meeting

ITRF

- Built on earlier meetings particularly to look at accelerator design Hywel Owen, Stuart Green
- Invited different communities to come together to discuss: Networks, CTRad
- “Heavy” ion position paper & UK Roadmap
- Published in BJR 2020
- doi/full/10.1259/bjr.20200247
- ITRF
- Cancers that are very difficult to treat, cancers of unmet need

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GUIDELINES & RECOMMENDATIONS

Heavy charged particle beam therapy and related new radiotherapy technologies: The clinical potential, physics and technical developments required to deliver benefit for patients with cancer

^{1,2}KAREN JOY KIRKBY, PhD, ^{1,2}NORMAN FRANCIS KIRKBY, ^{1,2}NEIL GUNN BURNET, ³HYWEL OWEN, ^{1,2,4}RANALD IAIN MACKAY, ⁵ADRIAN CRELLIN and ⁶STUART GREEN

¹Division of Cancer Sciences, University of Manchester, Manchester Cancer Research Centre, Manchester Academic Health Science Centre, Manchester, United Kingdom
²The Christie NHS Foundation Trust, Manchester, and University of Manchester, M20 4BX, UK
³University of Manchester/Cockcroft Institute, Manchester, United Kingdom
⁴Christie Medical Physics and Engineering, The Christie NHS Foundation Trust, Manchester, M20 4BX, UK
⁵NHS England National Clinical Lead Proton Beam Therapy, Leeds Cancer Centre, Leeds Teaching Hospitals Trust, Leeds, and St James's Institute of Oncology, Leeds Teaching Hospitals NHS Trust, Beckett Street, Leeds, LS9 7TF, UK
⁶Department of Medical Physics, University Hospital, Birmingham, Edgbaston, Birmingham, B152TH, UK

Address correspondence to: Karen Joy Kirkby
E-mail: karen.kirkby@manchester.ac.uk



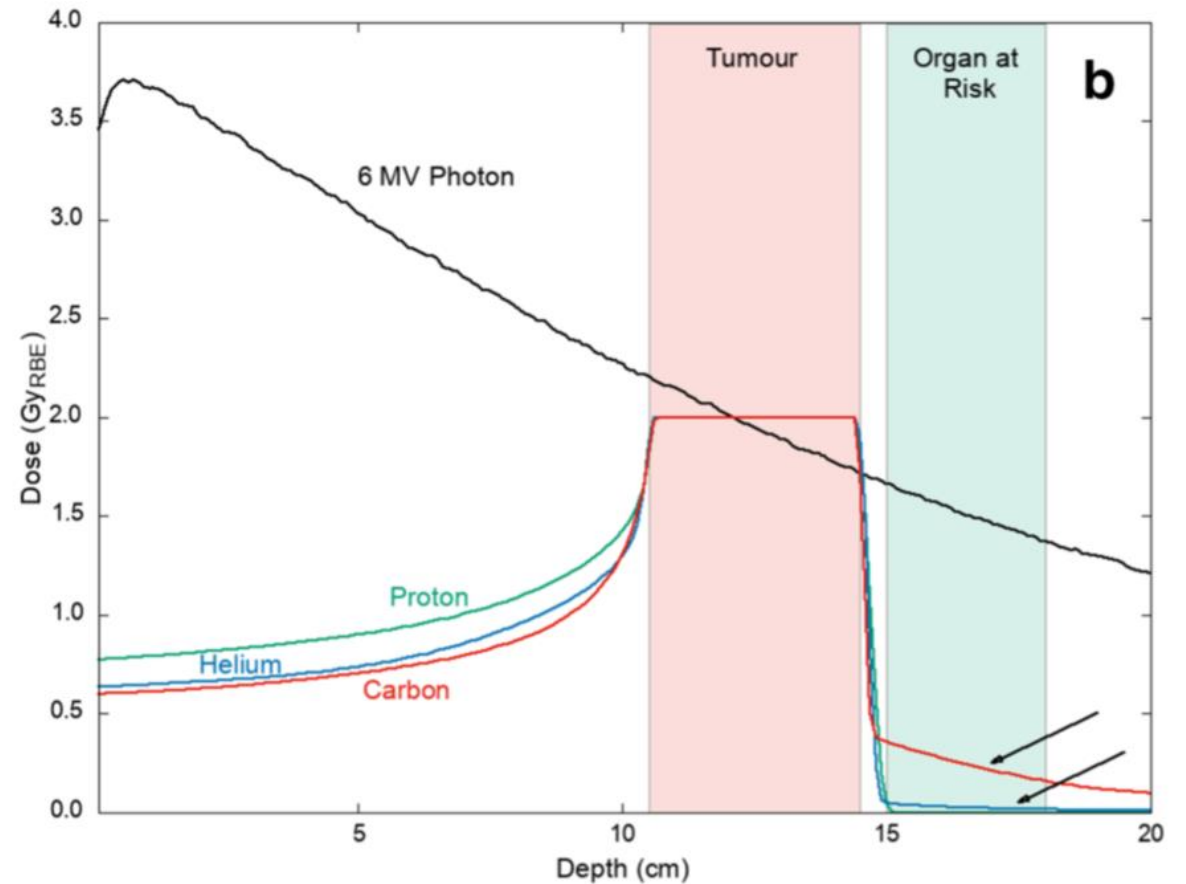
Insights: Birmingham meeting 2019

- Prof Adrian Crellin: UK clinical lead for PBT
- Learn from the past
- Overseas referral programme: gain experience in PBT
- Opportunity to develop PBT in UK: narrow window
- Not a lot of clinical evidence
- “When stars (Ministers) align”
- Grab the opportunity



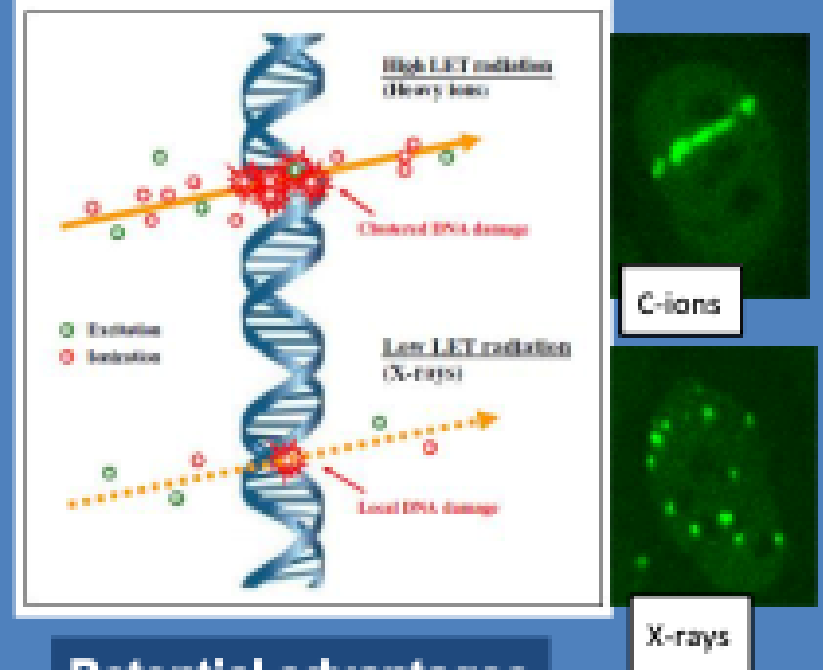
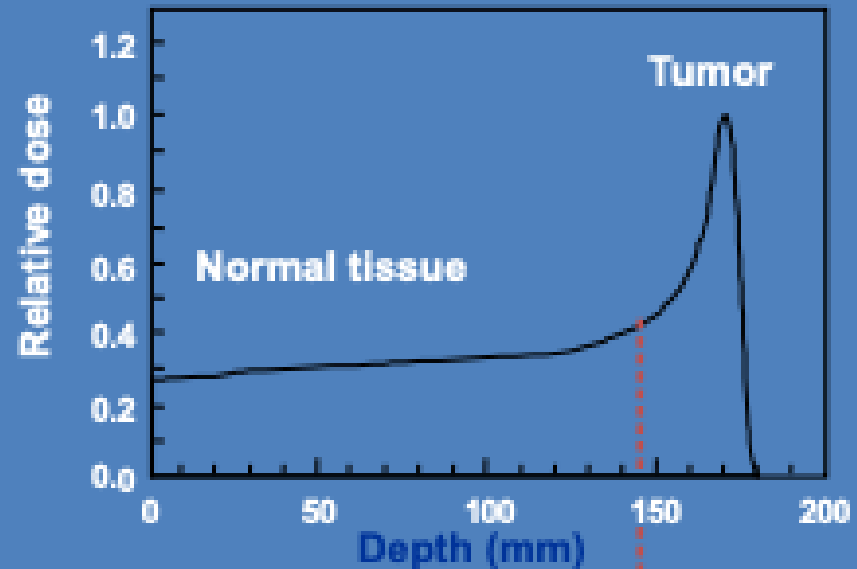
Why heavier ions He, C?

- Greater RBE especially at distal edge 😄 😞
- less scatter – tighter penumbra 😄
- normal tissue sparing? 😄
- Dose escalation? 😄
- Fragmentation tail 😞
- Skilled staff 😞 😄



Heavy ions

- Tinganelli and Durante
Cancers **2020**, *12*(10)
,
3022; <https://doi.org/10.3390/cancers12103022>



Potential advantages

Energy	high	low	High tumor dose, normal tissue sparing
LET	low	high	Effective for radioresistant tumors
Dose	low	high	Effective against hypoxic tumors
RBE	≈ 1	> 1	Radioresistant (S) phase cells are sensitized
OER	≈ 3	< 3	Fractionation spares normal tissue more than tumour
Cell-cycle dependence	high	low	Reduced angiogenesis and metastatization
Fractionation dependence	high	low	Systemic effects in combination with immunotherapy
Angiogenesis	Increased	Decreased	
Immune effects	Weak	Strong	

Is there a clinical need?

- Japanese results on pancreatic cancer (cancer of unmet need)
 - Sparked US interest
 - Trial
- Hypoxic; radioresistant tumours

UK

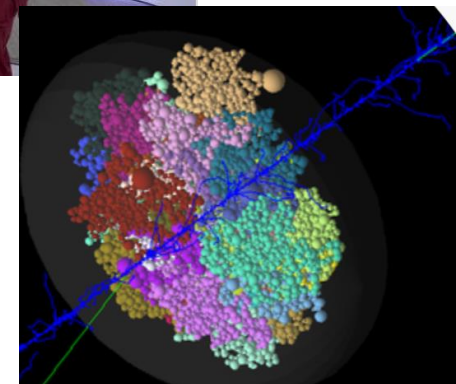
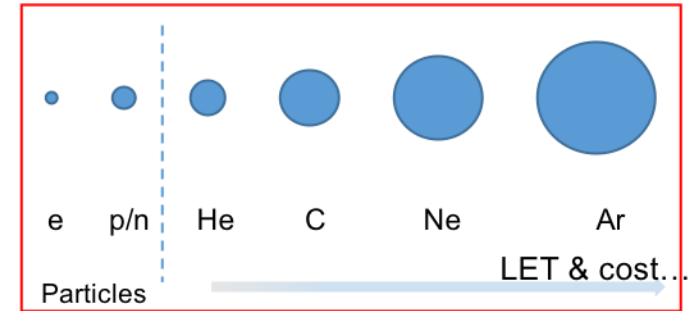
- UK Consultation
- CTRad and RadNet Emerging Radiotherapy Technologies Working Group need to be actively involved
- Important to learn from lessons in the past
- Multidisciplinary community



ITRF working with Stakeholders to build an infrastructure



- What type of beams are needed?
- What infrastructure is needed?
- Biology:
 - In vitro
 - In vivo
 - Associated biology infrastructure
- Route to clinic
 - What are the key questions that need to be answered
 - Does the proposed infrastructure provide a route to answering these questions
- FLASH (repeat questions above)
 - Add in radiochemistry
- STFC community (Physics, engineering)
- Fantastic Opportunity



Future for ITRF

- Learn from the past
- Use ITRF to demonstrate the Science case BUT also need to make a clinical case
- Opportunity to engage with CRUK RadNet community
- CTRad
- Be aware of difficulties at a time when NHS funding is very thinly stretched
- But shouldn't the UK have all of the tools in the radiotherapy tool box?
- “When stars (Ministers, funders) align”
- Grab the opportunity

