WP5 End-stations Update

25th April 2024

Tony Price on behalf of WP5

Consultation Meetings

- Consultation Meeting 1
  - Focus on Stage 1 in-vitro and stage 2 in-vivo
  - London/Online
  - December 2022
  - Attended by > 50 people
  - Agenda and presentations https://indico.stfc.ac.uk/event/668/

  - Consultation Meeting 2
  - Focus on Stage 1 in-vitro
  - Birmingham
  - June 2023
  - ~20 in person and online
  - Agenda and presentations https://indico.stfc.ac.uk/event/780/

Consultation Meetings

- Consultation Meeting 3
  - Focus on in-vivo
  - Liverpool (thanks to Narender and Milaan)
  - Jan 2024
  - Attended by ~20 people and two invited speakers
    - Martin Fray from Mary Lyons Institute
    - Prof David Killick (Professor of Vetinary Oncology)
- Primarily to discuss the legislations and implications on the whole facility of animal work, both experimental and companion animals
- Agenda and Presentations https://indico.stfc.ac.uk/event/923/

Consultation Meeting 3 - Outcomes

- Legislation required for animal work is different for vet studies and for experimental work on rodents. We must keep both of these in mind and some are complimentary, some contradictory for the work flow
- For experimental animal work
  - it is **essential to have animal houses on site** and it's a "one way trip" for the animals. Can be reared and provided by other facilities but cannot go back there after irradiation.
  - Facility must be close to animal source (where close was undetermined but <50km) for legislation
  - Licenses - Establishment license (PEL), project license (PPL), individual license (PIL)
  - PEL itself has 25 conditions which must be met
  - Mary Lyons can work with us to ensure we cover legislation as we need it (beyond the scope of WP5 ATM)
  - Controlled environments for avoid excess stress to animals 22 degrees C +/- 2, humidity 55% +/- 10%, controlled lighting
- Companion Animals
  - Needs consultants close by / in-house to protect animal welfare. Impact on location of ITRF
  - Trials can be undertaken if vet believes there is a potential benefit to the animal
  - Owners can provide consent to studies
  - Animals generally home same day and require somewhere on site for owners to wait. This would be a new call on the building design.

Conclusions and Recommendations

Conclusions

C1: The case for a change to the present baseline beam-delivery concept for the low and high energy *in-vitro* end stations and the *in-vivo* end station is not compelling and therefore the present baseline should be retained.

C2: A specification of 5% as the upper limit on the accuracy of the integrated dose measurement and its repeatability is sufficient for the dose-measurement uncertainty not to dominate the error budget of biological experiments.

C3: Any setup and end-station must be **"Simple, Robust, Reproducible, and Cheap"**.

C4: For the rest of the consultation process, the Stage 1 in-vitro experiments will assume the use of standard plastic cell dishes.

C5: An X-ray source to be included in the facility to allow control sample and low LET comparisons to be made with cultures in both the stage 1 and stage 2 *in-vitro* end-stations

C6: Integration of cell transport into the end-stations, and environmental stabilisation needs to be in the order of minutes to ensure cell viability.

Conclusions and Recommendations

Recommendations

R1: The radiobiological opportunities arising from the unique time structure that LhARA offers should be investigated.

R2: The experimental complications arising from using a low-energy proton beam must be considered carefully.

R3: The workflow and required cell-culturing facilities required to support a multi-user, quasi-continuous irradiation facility must be carefully planned.

R4: The impact of scattered irradiation on neighbouring samples must be evaluated carefully.

R5: The temperature ranges and the temperature and oxygen level stability required must be carefully considered.

R6: Development of the specification of the *in-vitro* end station and its operation should include careful consideration of the range of animals required, the location of animals pre and post-irradiation, the possibility of collaboration with existing animal-handling facilities, and the requirements for procedures other than irradiation to be carried out at the facility?

R7: Careful consideration should be given to the relative merits of co-locating the LhARA facility with an animal house or partnering with an existing animal house located at a distance from the LhARA facility.

R8: The Feasibility study for BioLIER should be studied.

R9: The user community should be sent a short form to complete highlighting their end-points requirements as these differ greatly between users.

Current Focus

- Write up CM3 report and update the conclusions and recommendations to match outcomes
- Consultation Meeting 4
  - To be held in Birmingham
  - Focus on user requirements for in-vivo stage 2 studies
  - Likely June but exact date TBC
  - Will circulate when I have more details.
- Term time and marking finished so progress improve