Towards better brain cancer treatment with novel in vitro models and fewer animal experiments

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Survival rates of brain cancer patients

Brain cancer is deadly

*Five-year survival rates...*

- **9/10** children with leukaemia now survive
- **9/10** people diagnosed with breast cancer will survive
- **2/10** people diagnosed with brain cancer will survive
- **<1/10** people with DIPG or glioblastoma will survive

Source: AHW National Cancer Statistics
Migrating tumor cells versus surgery

Tumor stem cell paradigm

- Stem cells and tumor stem cells:
  - Self-renewal (asymmetric cell division)
  - Indefinite proliferation potential
  - Differentiation

Mutations induced by environmental factors
Tumor migration in mice – after 3 months
anti-human vimentin IHC
Tumor migration
anti-human vimentin IHC
Experimental "patient-like" models

Biopsy → Cultures/Cell lines → In vivo model
3R potential

- A Pub Med search ("mice and glioma and year") identified:
  - 263 brain cancer studies in 2004
  - 856 brain cancer studies in 2014
  - More than 3-fold increase over 10 years
- 50,000 mice are supposed to be used for brain cancer studies in 2015
- Orthotopic models are app. being used in 50% of these studies corresponding to 25,000 mice/year
3D in vitro model

-In stem cell medium
3D in vitro model
3D in vitro model
In vivo model
2D model
Tumor cell migration on a flat surface
-in stem cell medium
Migration speed

[Graphs and images showing migration distance and speed over time for different groups labeled T111, T113, T78, T86, T87, and U87.]

[Images of migration processes at different stages labeled A, B, and C.]
Molecular characterization

- microRNA
- mRNA
- Protein
Conclusions – to be continued...

- Pronounced migration in 3D model
  - Stem cell medium
  - Fluorescence
  - Validated with stainings
  - Potential reduction of animal experiments
- Pronounced migration in 2D model
  - Stem cell medium
  - Potential reduction of animal experiments
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