

Combined effects of ionizing radiation and environmental/chemical factors as a function of age

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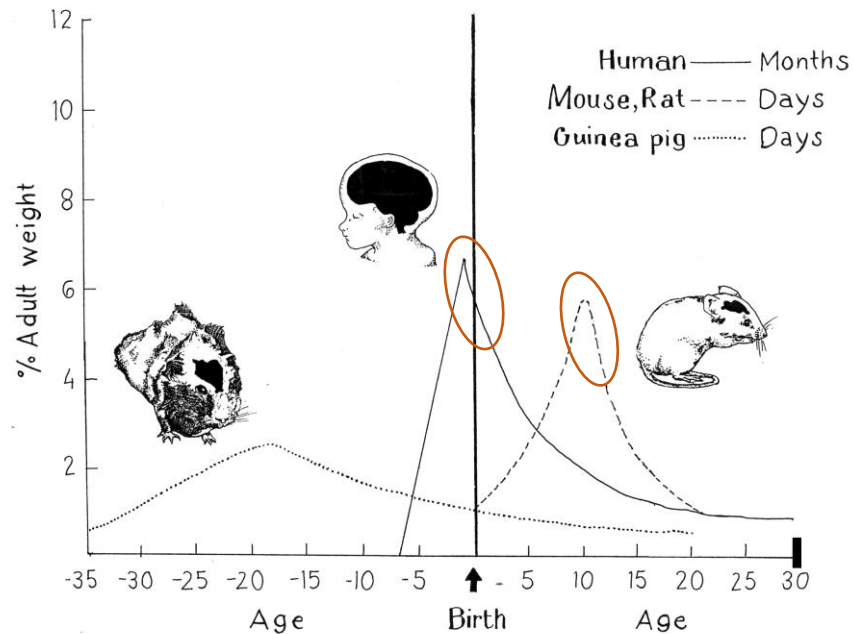
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Combined effects of ionizing radiation and environmental/chemical factors as a function of age

- The use of the neonatal animal model to explore and predict developmental neurotoxic effects from ionizing radiation, environmental and pharmaceutical agents
- Ionizing radiation - interacting with environmental agents
- Ionizing radiation - interacting with pharmaceuticals
- *Ionizing radiation (IR) - Ongoing research*
 - *IR + anaesthetic/analgetic/sedative agents*
 - *IR + anaesthetics + neuroprotective agents*

Developmental neurotoxicity of ionizing radiation and toxicants

Brain Growth Spurt



Critical window of brain vulnerability around PND 10 in mouse

- Disruption of the adult brain function
- Increased susceptibility in adults
- Alteration in neuroproteins

Studies on combined exposure:

MeHg + PCB, Eriksson et al., 2007

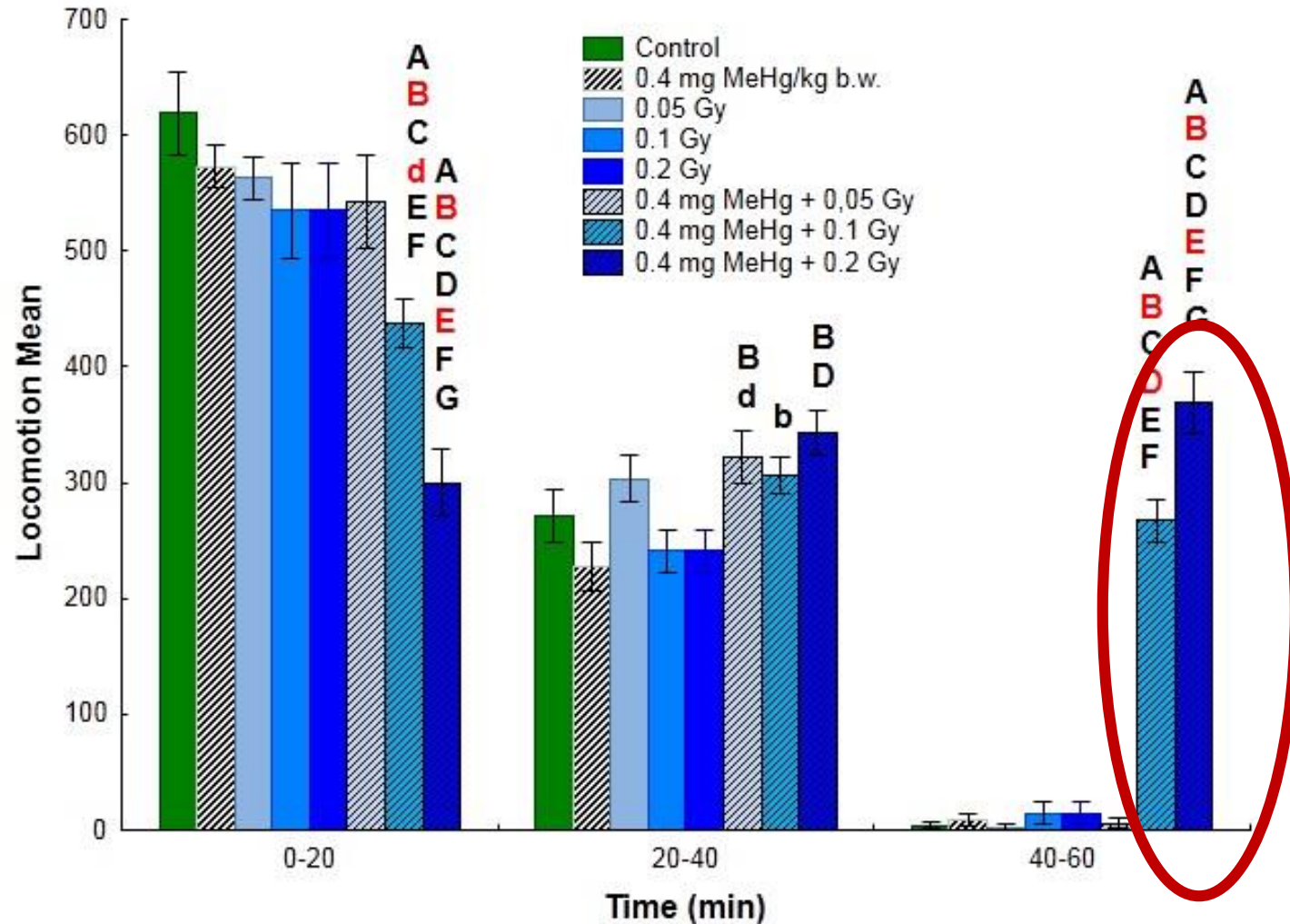
MeHg + PBDE, Fisher et al., 2008

Ketamine + Propofol, Fredriksson et al., 2007

Ionizing radiation + Ketamine, Buratovic et al., 2018

Ionizing radiation – interacting with environmental agents

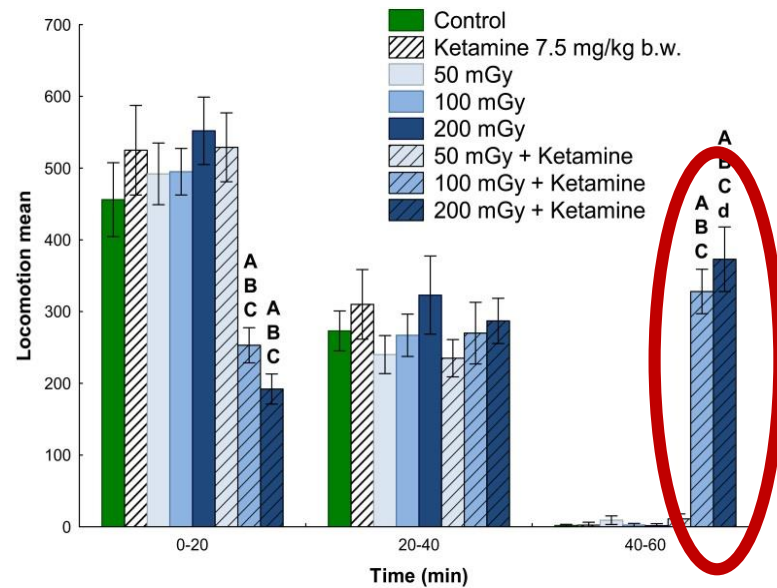
Developmental neurotoxicity of co-exposure to gamma-radiation and Methylmercury
Spontaneous behaviour, 2-month-old



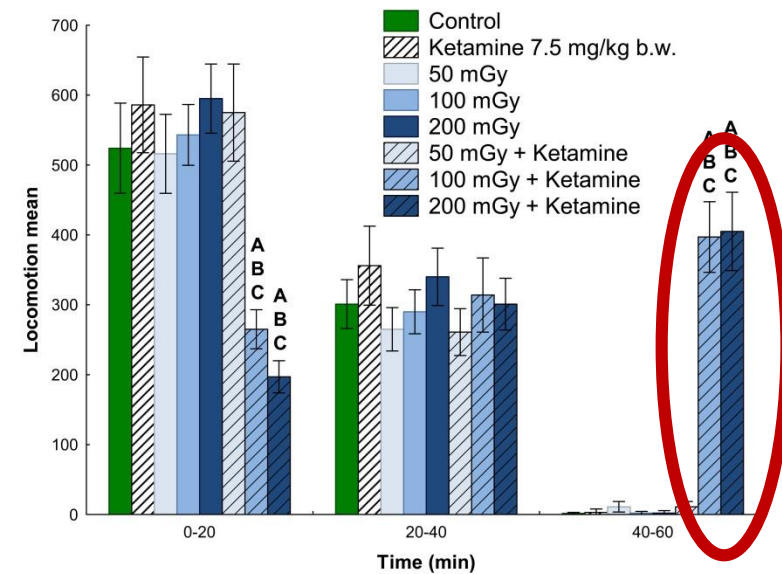
Ionizing radiation – interacting with pharmaceuticals

Developmental neurotoxicity of co-exposure to gamma-radiation and ketamine

NMRI 2 months male



NMRI 4 months male



- IR can interact with anesthetics to exacerbate developmental neurotoxicity
- The neurotoxic manifestations are of a persistent/long-lasting nature

Concluding remarks

- IR can interact with environmental toxicants (MeHg, nicotine, paraquat) and commonly used anaesthetic (ketamine) to shift the dose-response curve towards lower radiation doses
- The developmental neurotoxic effects are seen at doses where neither gamma radiation nor the environmental/pharmaceutical agents causes any effects
- IR alone or in combination with these chemicals can induce both acute and persistent effects on neurochemical composition (neuroprotein tau) and structural changes in hippocampal neurons

Ionizing radiation – *Ongoing research*

[Head: Dr. Assoc. Prof. Sonja Buratovic]

- *Ionizing radiation + anaesthetic/analgetic/ sedative agents*
- *Ionizing radiation + anaesthetics + neuroprotective agents*