

Clarifying the age gap between patients and animal models of bone and joint infection: A Systematic Review of 888 models

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Introduction

- Bone and joint infections (BJI) primarily occur in elderly patients¹
- Advances in innovation and fundamental understanding relies on experimental animal models
- The age of experimental animals used in BJI research are rarely discussed, although possibly quite fundamental



Human equivalent age

=

$\frac{\text{Reported experimental animal age}}{\text{Species Specific Conversion ratio}}$

Methods

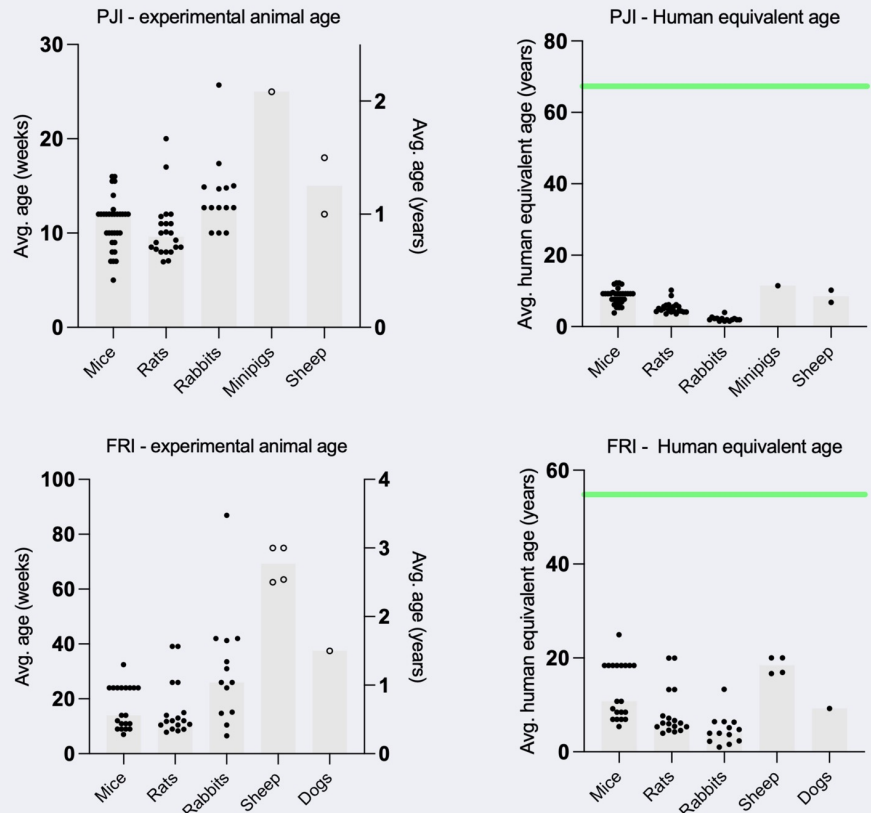
- 888 animal models met the inclusion criteria (animal models of PJI, FRI, IAO, COM and AHO in humans) based on a comprehensive PubMed MESH search
- Equivalent human age was calculated & compared with the average age of the corresponding patient population.
- Studies were sorted in type of disease modelled

Results

Average animal age across BJI research:

- Mice, rats, pigs & rabbits: 10 - 15 weeks
- Sheep, minipigs & dogs: 1 - 4 years
- Mean human-equivalent age <10 years for all species, except for sheep, whose human-equivalent age was approximately 20 years
- Six models had a human equivalent age above 25-years (not shown)

¹Kapadia, B.H., et al., Periprosthetic joint infection. Lancet, 2016. 387(10016): p. 386-394.



Scatter dot plot of the age of experimental animals modelling different bone and joint infections (left) and their corresponding human equivalent age (right). Values are shown as individual points and median indicated by bar. The green horizontal lines represent the average patient age of the respective disease. PJI= Peri-prosthetic joint infection. FRI=Fracture-related infection.

	Mice	Rat	Rabbit	Pig	Minipig	Sheep	Dog	Median
PJI	58.1	62.4	65.3	--	55.8	58.7	--	58.7
FRI	44.1	48.7	50.8	--	--	36.3	45.5	45.5
IAO	53.4	55.9	58.6	59.6	50.0	41.0	51.8	53.4
COM	52.4	53.9	56.6	--	46.4	31.5	44.2	49.4
AHO	-2.3	--	--	4.1	--	--	--	0.9
Median	53.4	54.9	57.6	59.6	50.0	38.7	45.5	

The age gap in years between the average age of patients with bone and joint infection (BJI) and the average age of the equivalent human age of the experimental animals used in BJI research. Colours indicating age gap, dark red = ≥60 years, red = 50 - 59 years, orange = 40 - 49 years, yellow = 30 - 39 years, green = <20 years, -- = no models reported. Values are expressed as rounded median. AHO is not included in the median value PJI= Peri-prosthetic joint infection. FRI= Fracture-related infection. IAO= Implant associated osteomyelitis. COM=Chronic osteomyelitis. AHO= Acute haematogenous osteomyelitis.

Conclusion

- Young immature animals are used to model elderly BJI patients
- The age gap between patients and animal models has remained unexplored in BJI research and should not be ignored as a confounding factor

Median age gap between patients and animal models is 51.4 years

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