Box 1: Summary of the studies conducted on telomerase and on telomerase-related fitness links.

Telomerase may act on individual performance either via a telomere length or a non-telomere length maintenance pathway (see main text). However, when looking at the potential role of telomerase as a determinant of inter-individual differences in performances and fitness, it is important to keep in mind that telomere length regulation is complex involving extensive protein interactions. Therefore, while this review focuses exclusively on telomerase, searching for links between fitness and other telomere length regulatory components are also of particular interest, including shelterin proteins [1], DNA repairing factors (e.g. Werners helicase), non-telomerase dependent lengthening of telomeres (Alternative Lengthening of Telomeres, ALT) (reviewed in [2]), proteins that bind with telomerase [3, 4], and microRNAs [5]. It is likely that an integrated approach investigating the interaction of all the different regulatory factors of telomere length in relation to a variety of life-history traits will prove powerful for understanding the role of telomeres in determining individual fitness.

Species	Telomerase activity (TA) or gene expression (TE)	Other components of telomere length (TL) regulation[#]	Sign and nature of the relationship with physiological / fitness traits	
Mammals[$]				
Humans *Homo sapiens*	TA in embryos TA in germ and stem cells, in lymphocytes TE differential expression in centenarians		Protection against cancer Cell proliferation Lifespan? Healthy ageing?	[6, 7] [8]
Chiroptera Leaf-nosed bat *Hipposideros armiger* Leschenault's rousette *Rousettus leschenaultia*	TA in several adult tissues		Relationship with heterothermy	[9]
Ringtailed lemur *Lemur catta* Spider monkey *Ateles geoffroyi* Squirrel monkey *Saimiri sciureus* Rhesus monkey *Macaca mulatta* Orangutan *Pongo pygmaeus* Pigmy chimpanzee *Pan paniscus*	No activity detected TA detected in fibroblast cell culture after transfection with human hTERT	Possibly ALT		[10]

Dog *Canis lupus familiaris* Cat *Felis catus* Pig *Sus scrofa* Sheep *Ovis aries*	TA in germ cells Polymorphisms in *TERT* gene TA in germ cells		No link with lifespan	See [11] [12] See [11]
Laboratory mice *mus musculus* *Mus spretus* Long-Evans rats Laboratory mice *mus musculus* 15 rodents species	TA in testes, ovary, breast, colon and liver TA only in cell cultures TE (mTERT) even in telomerase negative tissues TA in white cells TA in somatic tissues	 ALT	 Increased in response to stress Telomere length maintenance in early embryo development Inversely related to body mass No relation with lifespan Protection against cancer	[13] [13] [14] [15] [16, 17]
Leporidae European white rabbit *O. cuniculus* Black-tailed Jack rabbit *O. californicus* Swamp rabbit *S. aquaticus* Ochotonidae North american pika *O. princeps*	No activity detected TA in ear snips cells		Protection against cancer	[18]
Horse *Equus equus* Donkeys *Equus asinus*	No activity detected (even in tumor) TA in testis			See [11]
Indian muntjak *Muntiacus muntjack*	No activity detected			[11, 18]
Birds				
Chicken *Gallus gallus*	TA in embryos and in reproductive and immune tissues TE in blood cells		Proliferative potential of the tissues	[19, 20]
Leach's storm petrel *Oceanodroma leucorhoa* Common tern *Sterna hirundo* Zebra finch *Taeniopigya guttata* Tree swallow *Tachycineta bicolor*	TA in several tissues at adult stage TA in several tissues at young stage		Proliferative potential of the tissues Lifespan	[21, 22]
Reptiles				
Frillneck lizard *Chlamydosaurus kingii*	TE in blood cells		Positive relationship with TL	[23]

Sic-lined racerunner *Cnemidophorus sexlineatus*	TA in several tissues		Regenerative capacity	[24]
Common wall lizard *Podarcis muralis* Carolina anole *Anolis carolinensis*	TE in tail blastoma		Regenerative capacity	[25]
Mud turtles *Kinostermon flavescens* Snapping turtle *Chelydra serpentine* Painted turtle *Chrysemys picta* Omate boc turtle *Terrapene ornata*	TA in the gonads only TA in the gonads and other tissues		Suggested relationship with regeneration and absence of apparent senescence	[26] See [11]
Amphibians				
African clawed frog *Xenopus leavis*	TA in testes, spleen, liver and embryos		A role not only related to DNA replication during embryogenesis	[27]
Crustacea				
Lobster *Homarus americanus*	TA in several tissues		A parallel in made with indeterminate growth	[28]
Green sea crab *Carcinus maenas*	TA in several tissues		Tissue regeneration Absence of age-related cancer	[29]
Fish				
Rainbow trout *Oncorhynchus mykiss* Zebrafish *Danio Rerio* Dogfish shark *Squalus acanthias* Little skate *Raja erinacae* Mackerel *Scomber scombrus* American eel *Anguilla rostrate* Killifish *Fundulus heteroclitus* Japanese medaka *Oryzias latipes* Flounder *Pleuronectes americanus*	TA in several tissues TA in several tissues	Non-canonical function of telomerase	A parallel in made with indeterminate growth Myelopoiesis. Young survival, adult fertility and lifespan determinant Tissue regeneration. No association with lifespan	[30] [31-33] [29, 34, 35]
Insects				
Isoptera Blattaria Lepidoptera Hymenoptera Trichoptera Coleoptera Sternorrhyncha	TA in head gonads or whole body protein extracts, in both adults and embryos Higher TA activity in queens of honeybees		Potential role in cell proliferation and organism development Queen determination developmental process / longevity	[36-38] [39]
Dipteria Orthoptera Zygentoma Phasmida	No activity detected			[36, 40]
Echinodermata				

Red sea urchin *S. franciscanus* Green sea urchin *L. variagatus*	TA in mature eggs and adult various tissues		No link with lifespan	See [11]
Golden star tunicate *Botryllus schlosseri*	TA in germ and embryonic tissues and in adult bud rudiments		Necessary for progenitor and stem cells	[41]
Lower metazoan				
Porifera	TA in somatic and germ cells		Not obligatory for proliferative capacity	See [11]
Cnidaria	TA in gonads and ctenophore		NA	[42]
Annelids *Aeolosoma viride*	TE in blastemal		Regeneration	[43]
Planarian flatworm *Schmidtea mediterranea*	TE expression in adult stem cells		Somatic telomere maintenance during sexual reproduction	
Plants				
Arabidopsis thaliana	TA in callus		Growth and development	[44]
Melandrium album	TA in germinating seeds and roots		Growth and development	[45]

$^{\$}$ TERT gene has been cloned in platypus *Ornithorhynchus anatinus* [46]

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