

loyal

cellular longevity, inc.



# What is Loyal?

Loyal is a clinical-stage veterinary medicine company dedicated to

- Developing therapies to slow aging in dogs
- Reducing the incidence and impact of age-associated disease in dogs



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# Our Mission

**Increase Lifespan**  
(years lived)



**Increase Healthspan**  
(healthy years lived)



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# Who is Loyal?

## Loyal's executive team



CELINE HALIOUA  
**FOUNDER & CEO**



MARK JOHNSON, PHD  
**EVP, DEVELOPMENT**



MICHAEL LACROIX-FRALISH, PHD  
**VP, AGING BIOLOGY**



KAREN GREENWOOD  
**VP, REGULATION & STRATEGY**



MCKINLEY HINDI  
**VP, OPERATIONS (incoming)**



TOM ROSEBERRY, PHD  
**DIR., COMPUTATIONAL BIOLOGY**



BRENNEN MCKENZIE, VMD  
**DIR., VETERINARY MEDICINE**

THE LONGEVITY FUND



REGENERON

KindredBio

Genentech



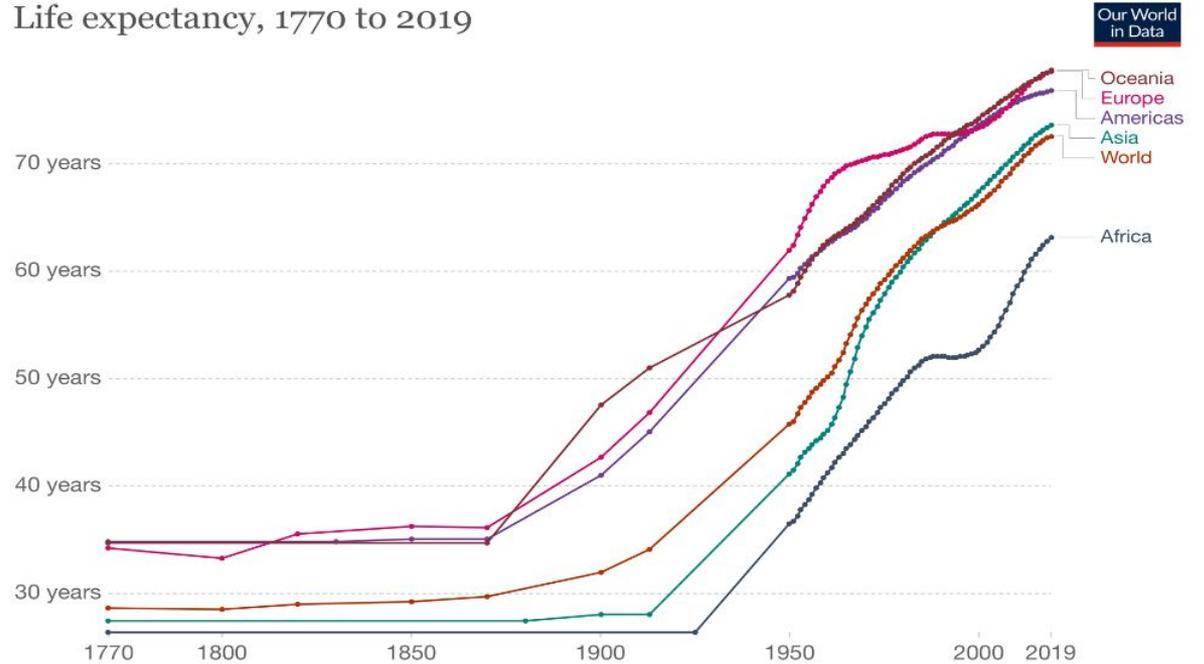
zoetis



# Why Aging?

- Lifespan has increased dramatically in humans (and probably dogs)
- Mostly due to reduction in early-life mortality
- Healthspan has increased much less
- Age-associated diseases are very common

Life expectancy, 1770 to 2019



Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019)

Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.

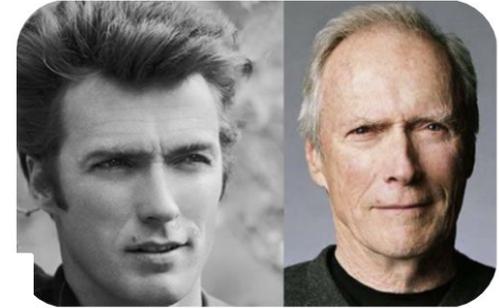
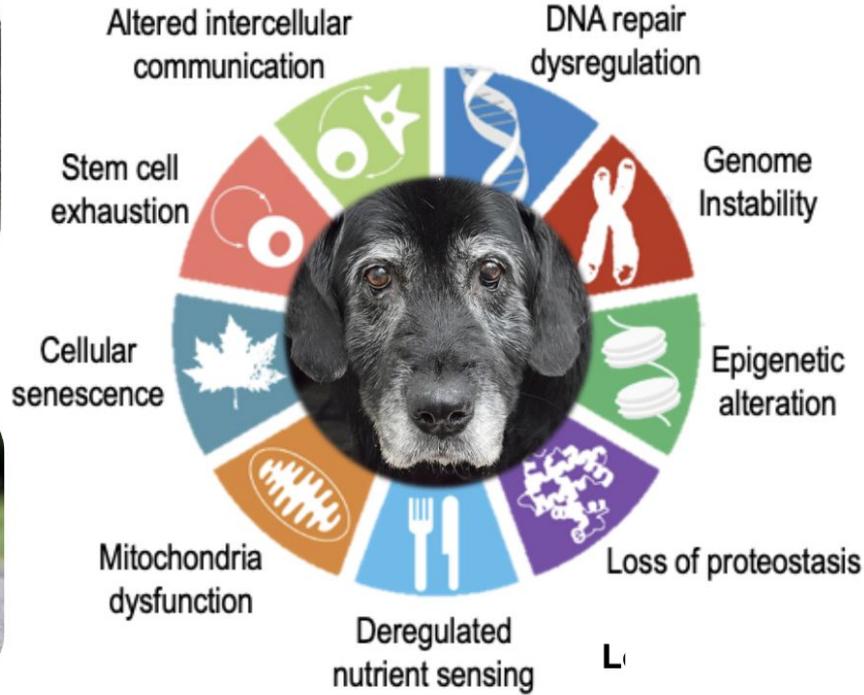
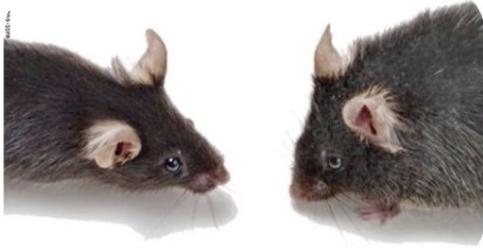
OurWorldInData.org/life-expectancy • CC BY

# Why Aging?



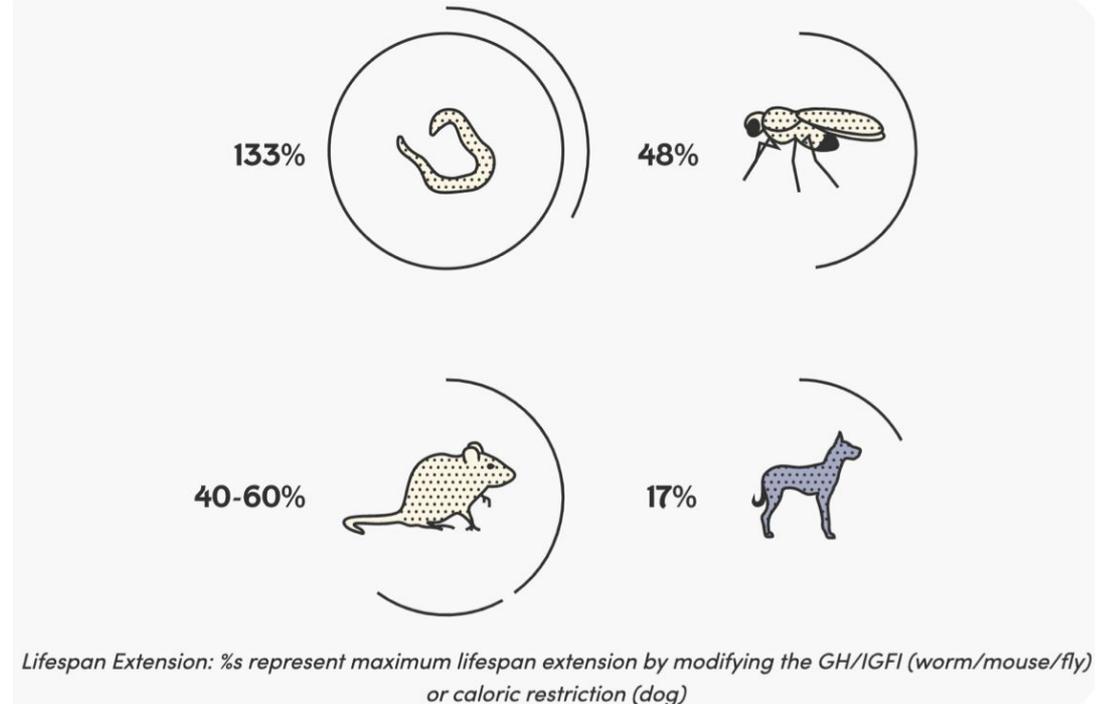
- Aging is a common risk factor for numerous diseases:
  - Neoplasia
  - Musculoskeletal disease
  - Cardiac disease
  - Cognitive dysfunction
- Aging creates a huge burden for dogs and owners
  - Diminished quality of life
  - Costs of care

# Aging mechanisms can be understood and influenced



# Lifespan & Healthspan Can be Extended

- Lab animal studies have shown dramatic increases in lifespan and healthspan with various interventions
- A multiyear caloric restriction study in Labrador retrievers showed an increase in lifespan of almost 2 years compared with littermates fed normally!



# Why Dogs?

- Traditionally, aging research has largely focused on laboratory animals living in controlled, unnatural environments
- Dogs **share our environments**, eat varied diets, experience varied stimuli
- Diverse **genetic** structure and **phenotypic variation** allows for powerful comparisons within dogs
- **We have a personal investment in their health and well-being**



# The Healthspan Study

- Multicenter, Observational Study
- Evaluating Aging Assessment Tools
  - HRQL (owner quality of life survey)
  - Frailty Index (veterinarian assessment tool)
  - Clinical lab values
  - Epigenetic aging markers
  - Other aging biomarkers

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# Healthspan Study

**Large dogs age >2x faster than small dogs**



Our average  
lifespan is only  
7 years



We can live on  
average 16  
years



# Healthspan Study

Determine if HRQL and Frailty Index can capture differences in aging between large and small dogs

Investigate biomarkers for healthspan and lifespan



**YOUNG SMALL DOGS**

<25 lbs ; 2-5 years

VS

**OLD SMALL DOGS**

<25 lbs; ≥7 years

VS

VS

**YOUNG GIANT BREED**

VS

**OLD LARGE DOGS**

>50 lbs; ≥7 years

rapid aging



# Future Studies

## LOY-001

- Specifically targets a cellular mechanism that is hypothesized to cause large and giant breed dogs to age faster and have shorter lifespans than their small-breed companions
- Expected to improve metabolic fitness and extend healthspan and lifespan in large and giant-breed dogs
- Pilot studies have shown that LOY-001 safely and efficaciously modulates the target biomarker.
- **Pivotal field trial to begin Q4 2021**

## LOY-002

- Intended for use as a treatment after symptoms of cognitive and physical aging have appeared
- Expected to improve insulin sensitivity and metabolic fitness, extend lifespan, and reduce the occurrence and impact of age-associated disease
- Beneficial for dogs of all ages and sizes
- **Pivotal field trial to begin Q4 2021**



# Other Projects



Loyal, will study epigenetic changes in canine DNA using samples from the Foundation's Golden Retriever Lifetime Study, investigating how various biomarkers change throughout life and can be predictive of future health outcomes, including cancer.



Loyal has licensed epigenetic clock technology developed at UC San Diego and is using this and other tools and data to develop methods for accurately measuring biological age in dogs.



# Learn More About Loyal

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Canine life-extension research by the startup Loyal could lead to breakthroughs for the rest of us. (Bloomberg Business Week)