

Presentation by Joan Mannick, MD

**WEBINAR: *COVID-19: Can the Science of Aging move us Forward?***

*March 24, 2020*



american federation  
for aging research

resTORbio™





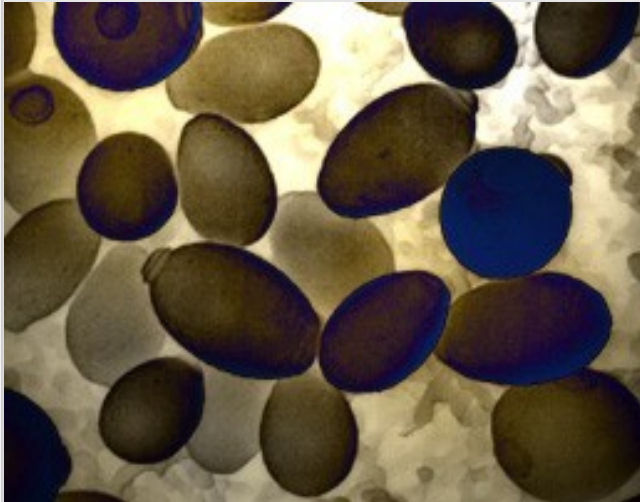
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# TORC1 is an evolutionarily conserved pathway that regulates aging



Yeast



Worms



Flies



Mice



TORC1 inhibition has extended lifespan and healthspan in multiple preclinical species

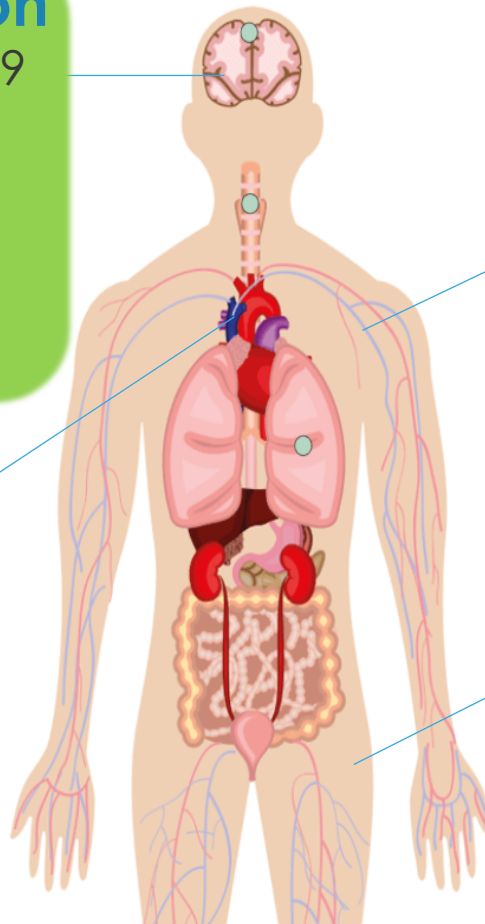
# Inhibition of TORC1 has the potential to improve the function of multiple aging organ systems

## Improved Neurologic Function

Tain et al., *Nature Neuroscience*, 2009  
Malagelada et al., *J Neurosci*, 2010  
Spilman et al., *PLoS ONE*, 2010  
Halloran et al., *Neuroscience*, 2012  
Majumder et al., *Aging Cell*, 2012  
Neff et al., *JCI*, 2013

## Reversal of aging-related cardiac dysfunction

Flynn et al., *Aging Cell*, 2013  
Dai et al., *Aging Cell*, 2014  
Chiao et al., *Aging*, 2016



## Reversal of aging-related immune dysregulation

Chen et al., *Science Sig*, 2009  
Selman et al., *Science*, 2011  
Neff et al., *JCI*, 2013  
Hurez et al., *Aging Cell*, 2015

## Improvement in physical activity

Selman et al., *Science*, 2011  
Harrison et al., *Nature*, 2009  
Wilkinson et al., *Aging Cell*, 2014  
Flynn et al., *Aging Cell*, 2013

In Phase 2 clinical trials enrolling > 900 people 65 years of age and older, RTB101 was observed to decrease the incidence and/or severity of respiratory tract infections

**Phase 2a trial**  
264 healthy elderly  
RTB101 10 mg QD

**42% reduction** in the rate of RTIs ( $p=0.006$ )

**Antiviral defense** systems were upregulated in whole blood

RTB101 was well-tolerated (Mannick et al, *Sci Transl Med*, 2018)

**Phase 2b trial**  
652 high-risk elderly  
RTB101 10 mg QD

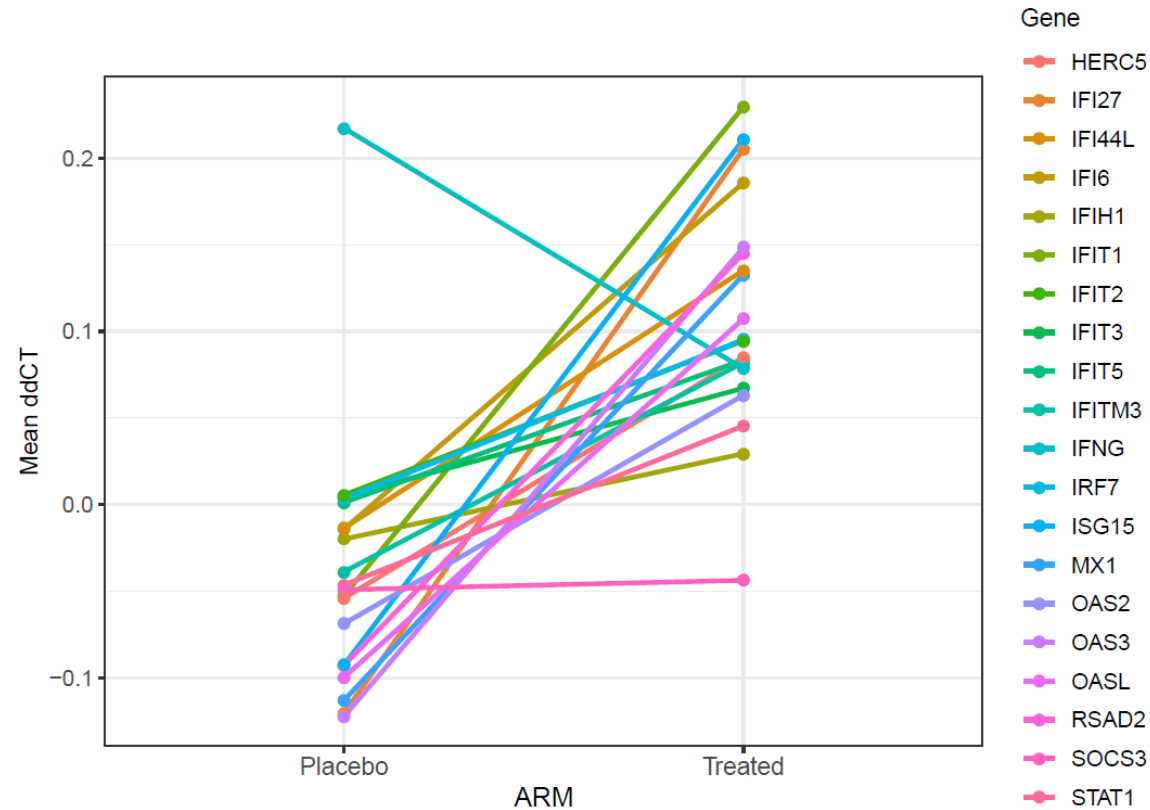
**30.6% reduction** in the percent of patients with laboratory-confirmed respiratory tract infections ( $p=0.025$ )

**52.1% reduction** in percentage of subjects with severe laboratory-confirmed respiratory tract infection symptoms ( $p=0.034$ )

5 day reduction in the time to alleviation of moderate to severe symptoms due to laboratory-confirmed RTIs ( $p=0.025$ )

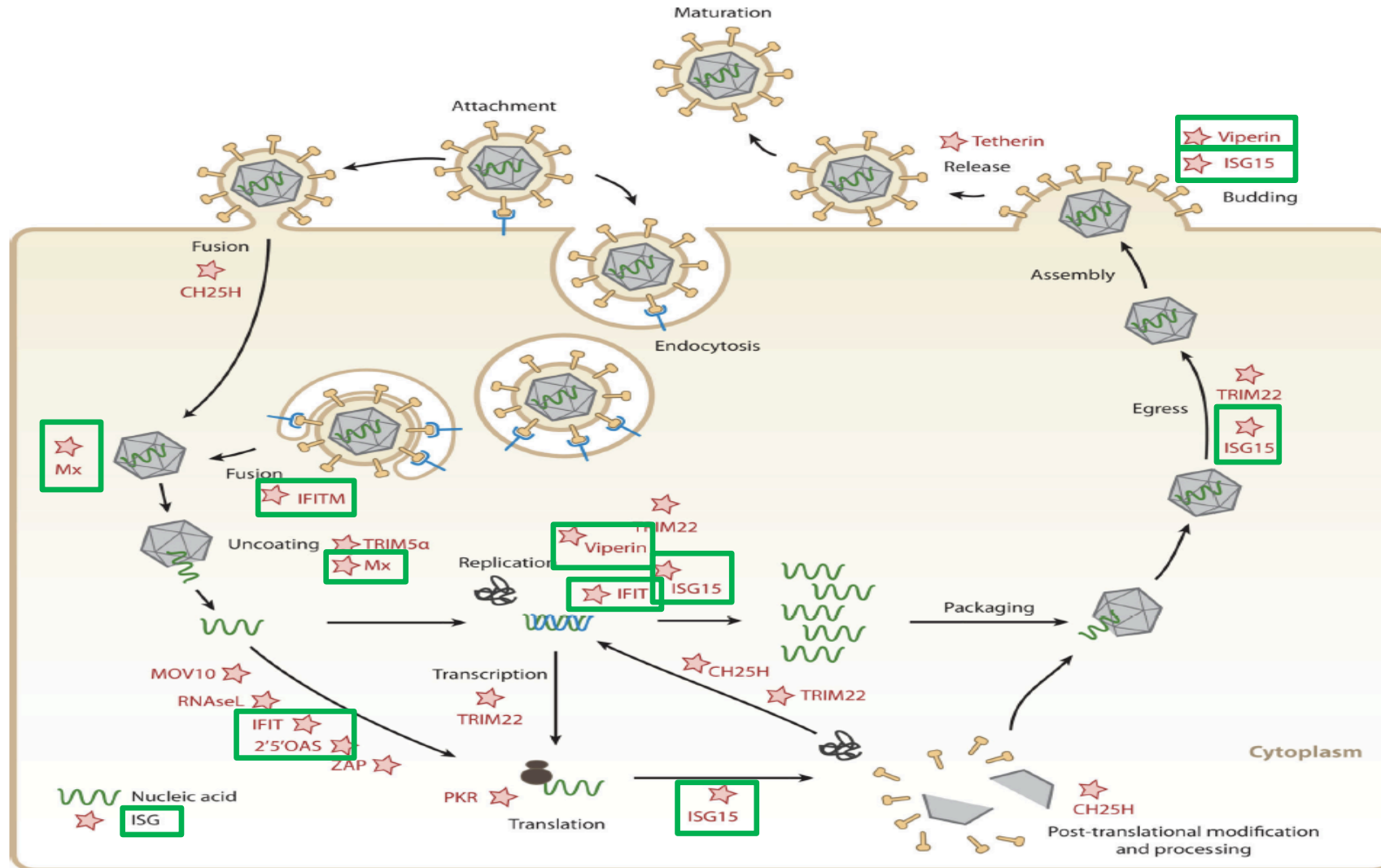
RTB101 was well-tolerated

# Phase 2b: RTB101 10mg QD was observed to increase expression of innate antiviral genes



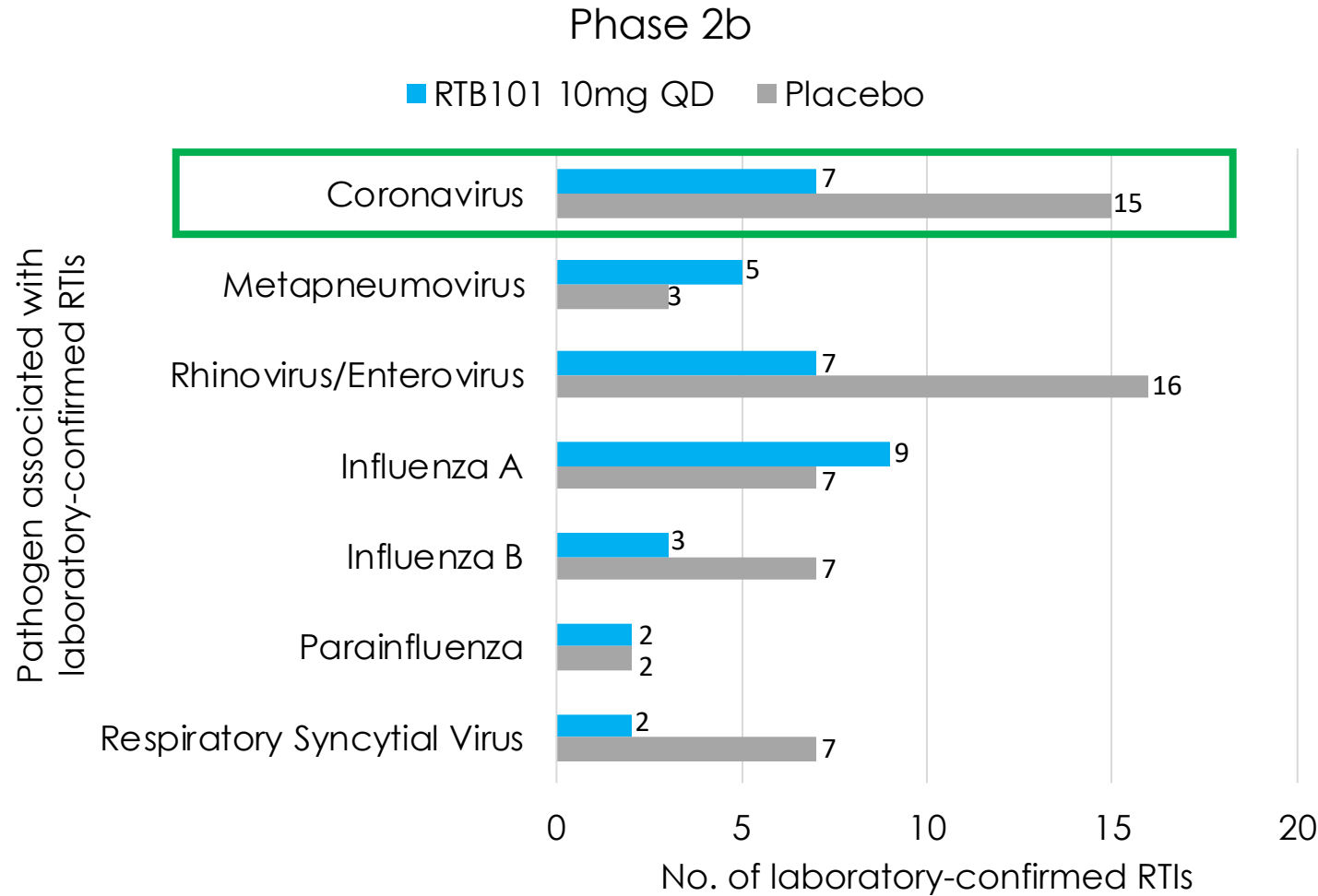
	Placebo n (%)	RTB101 10mg QD n (%)	p-value
ISGs upregulated (mean ddCT ≤0)	5 (25%)	19 (95%)	0.00001
ISGs not upregulated (mean ddCT >0)	15 (75%)	1 (5%)	-

# Antiviral genes observed to be upregulated in subjects treated with RTB101 encode proteins that inhibit multiple steps in viral replication





# Phase 2b: RTB101 reduces the incidence of respiratory tract infections caused by multiple viruses including coronavirus



# RTB101 was well-tolerated in high-risk elderly patients through Week 24

- Adverse events (AEs) were balanced between the RTB101 10 mg QD and placebo cohorts
- 1 unrelated death occurred in the RTB101 10mg QD cohort (patient was hit by car while riding a bicycle), 1 unrelated death occurred in the RTB101 10mg BID cohort and 1 unrelated death occurred in the placebo cohort (both from unknown causes)

	% of patients in treatment group	
	RTB101 10mg QD	Placebo
<b>Mild AEs</b>	74.4%	71.7%
<b>Moderate AEs</b>	38.1%	40.6%
<b>Severe AEs</b>	5.7%	7.8%
<b>Serious AEs</b>	4.5%	7.8%
<b>Discontinued study drug due to an AE</b>	5.1%	5.6%

# Conclusions

- In preclinical species, TORC1 inhibition has been shown to improve the function of multiple aging organ systems including the immune system
- Randomized, double-blind placebo-controlled clinical trials in almost 2,000 older adults have been completed to determine if TORC1 inhibition with RTB101 improves immune function in older adults
- In a phase 2b trial, RTB101 10 mg once daily was observed to be well tolerated, upregulate innate antiviral gene expression, and reduce the incidence of laboratory-confirmed respiratory tract infections caused by multiple viruses including coronavirus in older adults age  $\geq 65$  years.
- RTB101 has the potential to decrease the severity of COVID-19 infections in adults age  $>65$  years.