

# The anti-diabetic potential of black and green teas

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# Introduction: Tea

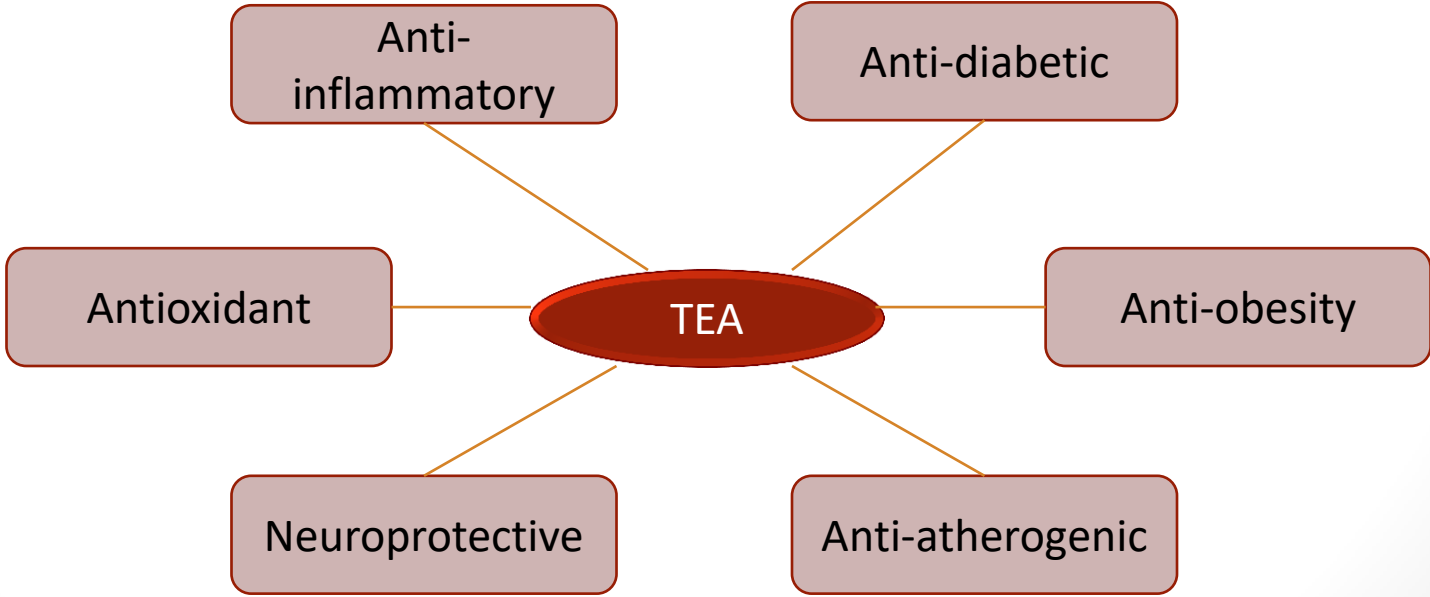


*Camellia sinensis*

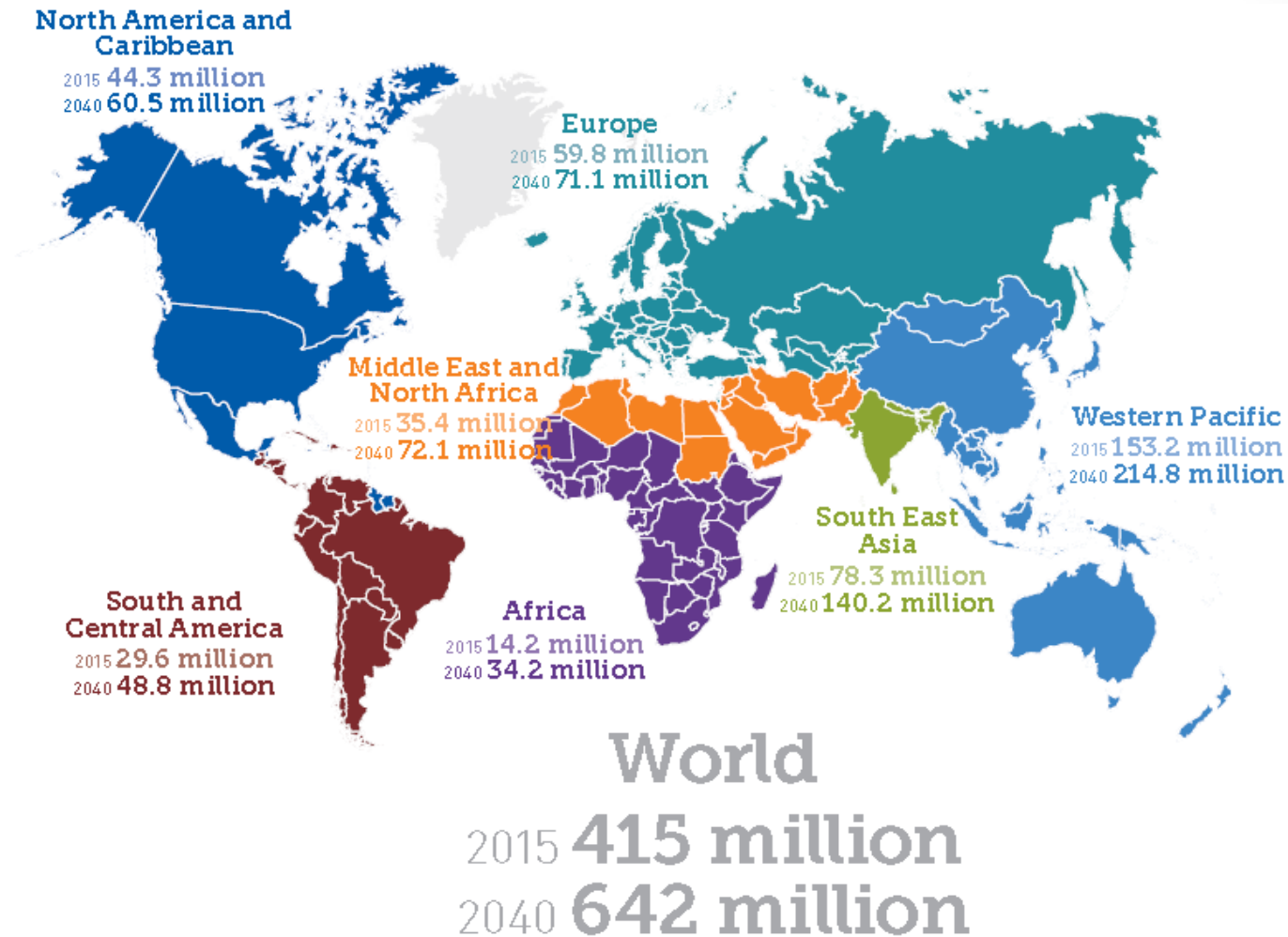
No fermentation → Green tea



Fermentation → Black tea



# Introduction: Diabetes Statistics



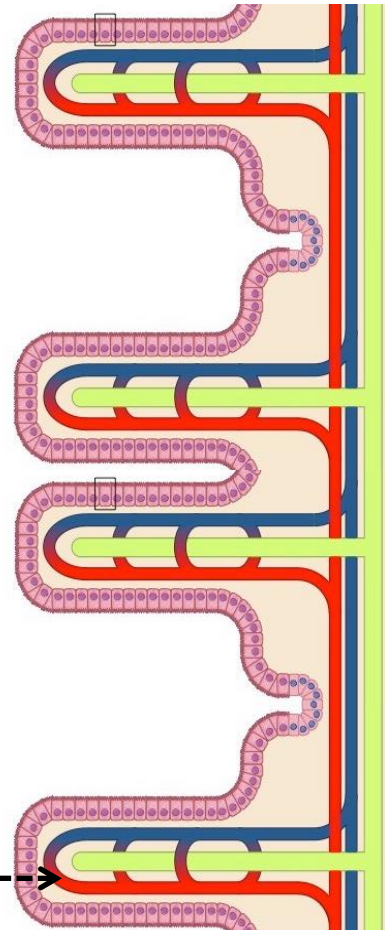
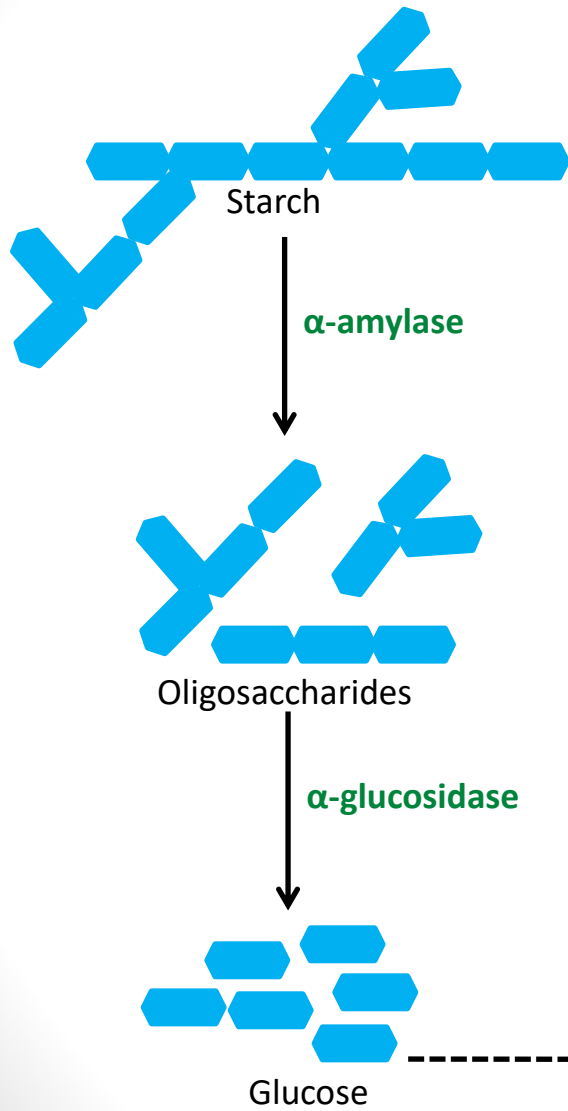
Estimated number of people with diabetes worldwide

(IDF Diabetes Atlas, 2015)

# Introduction: Diabetes Statistics

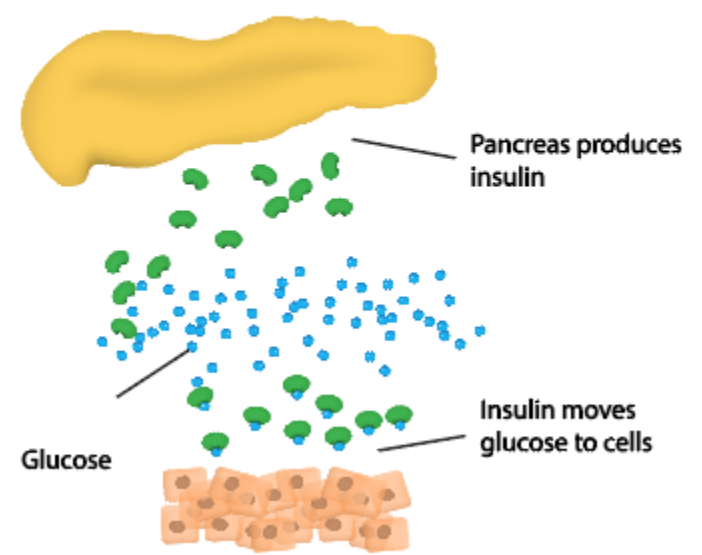
Diabetes estimates (20-79 years)	Mauritius	Reunion	Madagascar	Comoros
Prevalence, %	22.3	15.8	4.0	9.9
% of diabetic population	18.3	13.0	1.5	3.6
Diabetes related deaths	2931.2	NA	5580.2	318.7
Mean diabetes related expenditure (USD), per person	934.3	NA	111.4	152.2

# Introduction: Post-prandial hyperglycemia

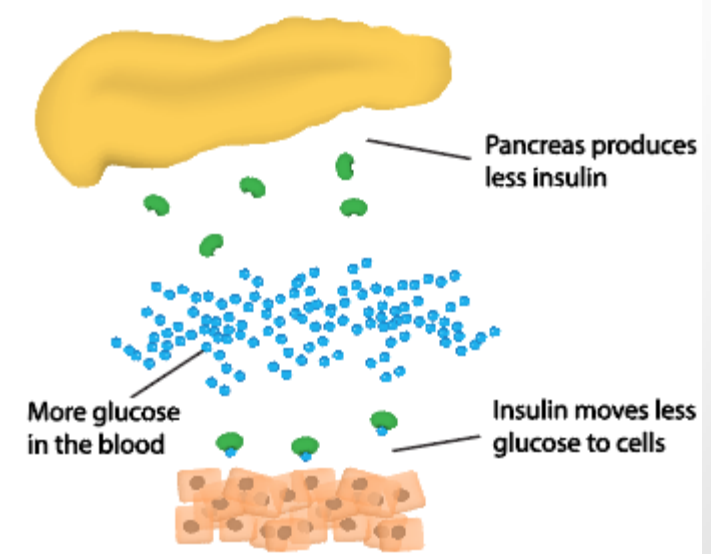


Post-prandial hyperglycemia

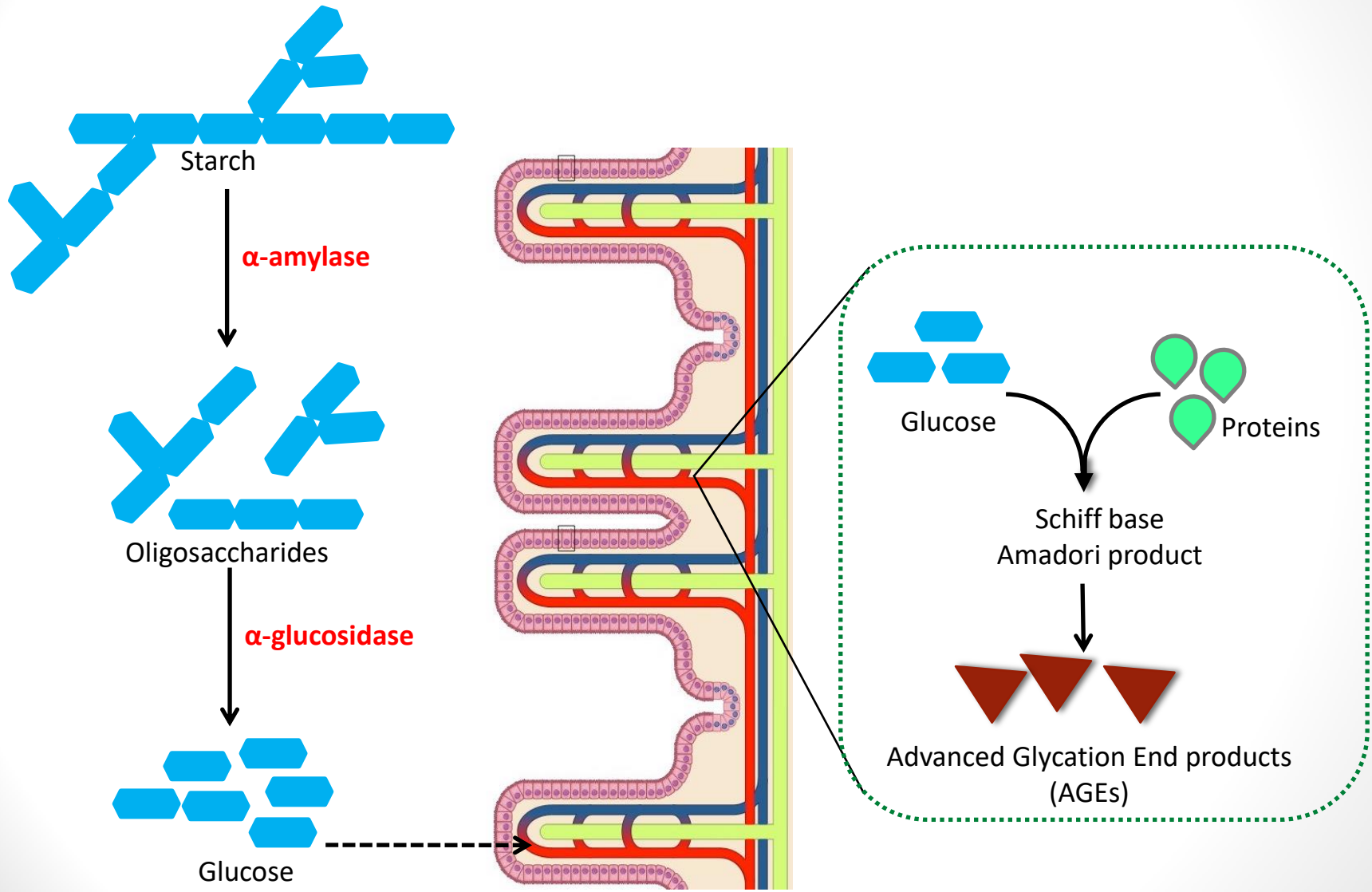
## Normal



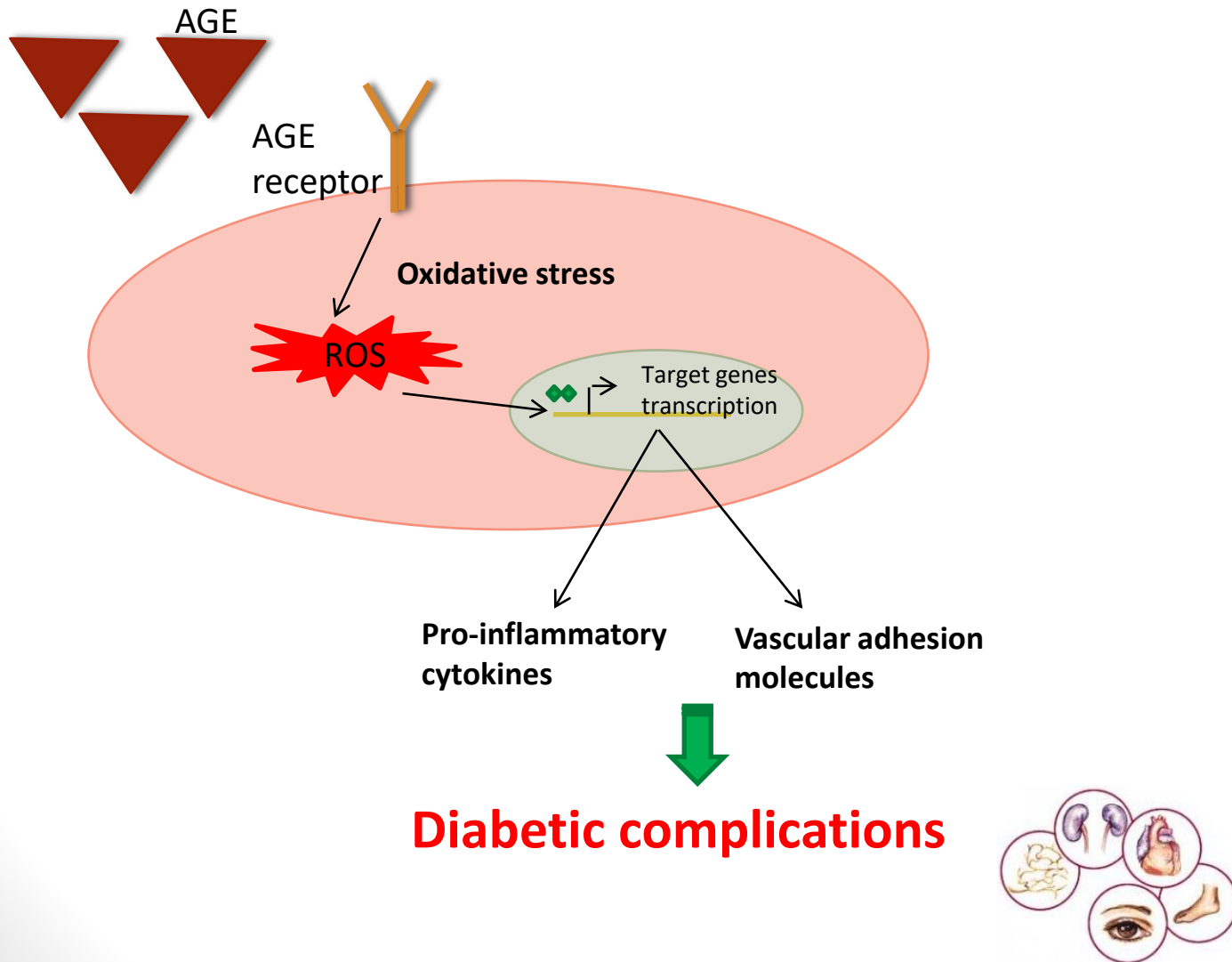
## Diabetic



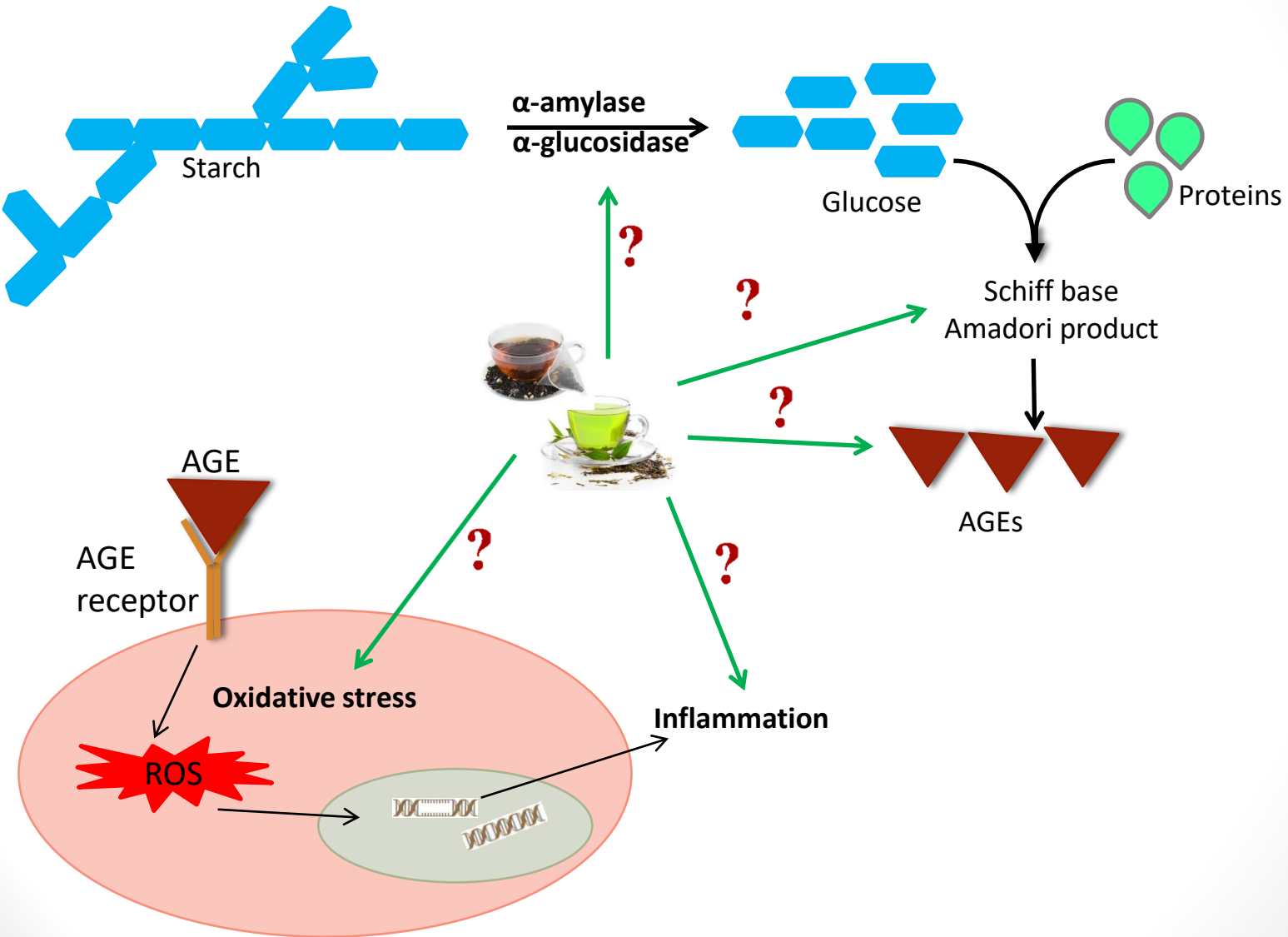
# Introduction: Glycation



# Introduction: AGEs & diabetic complications

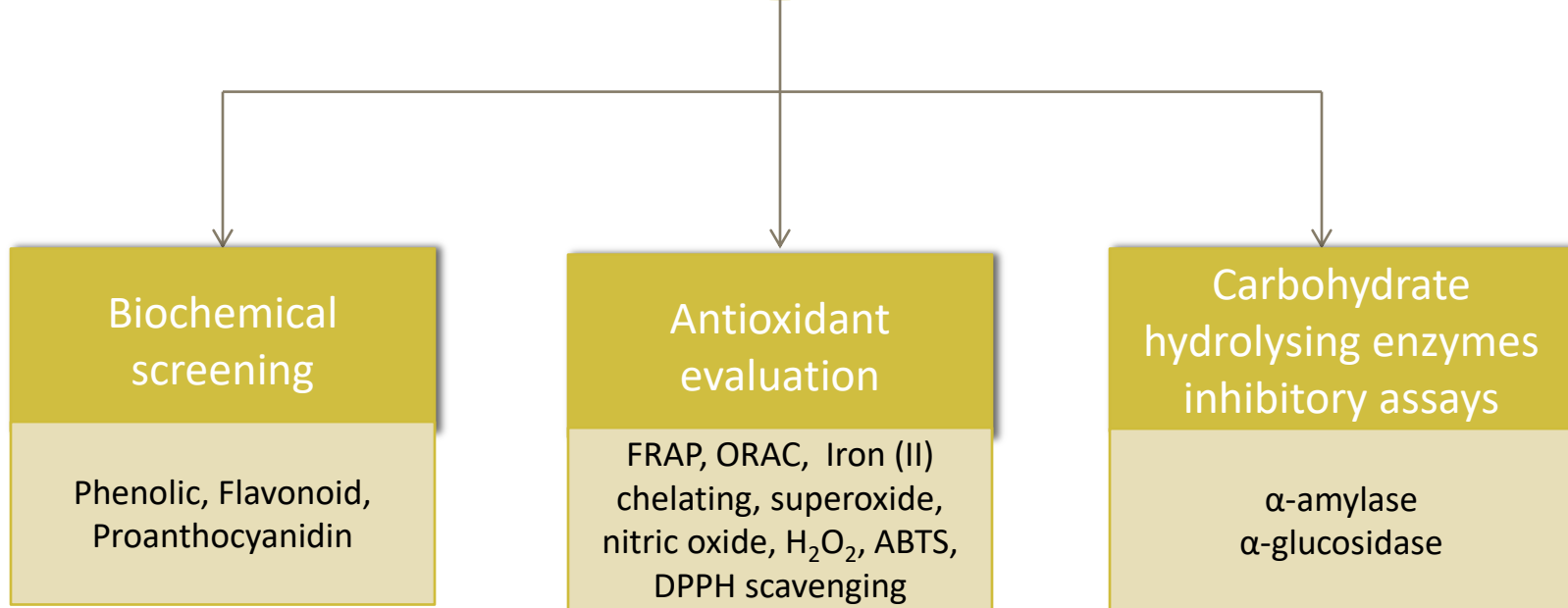


# Our focus





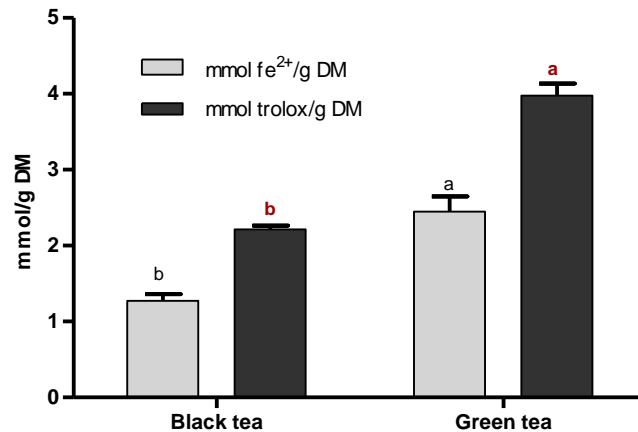
# Biochemical, antioxidant & carbohydrate hydrolysing inhibition screening



# Rich in polyphenols

Tea	TPC mg GAE per g	TFC mg CE per g	TPrC mg (CEE) per g
Black tea	99.83 ± 1.51 <sup>b</sup>	23.42 ± 0.81 <sup>b</sup>	2.03 ± 0.09 <sup>b</sup>
Green tea	179.47 ± 8.55 <sup>a</sup>	43.50 ± 0.81 <sup>a</sup>	7.14 ± 0.28 <sup>a</sup>

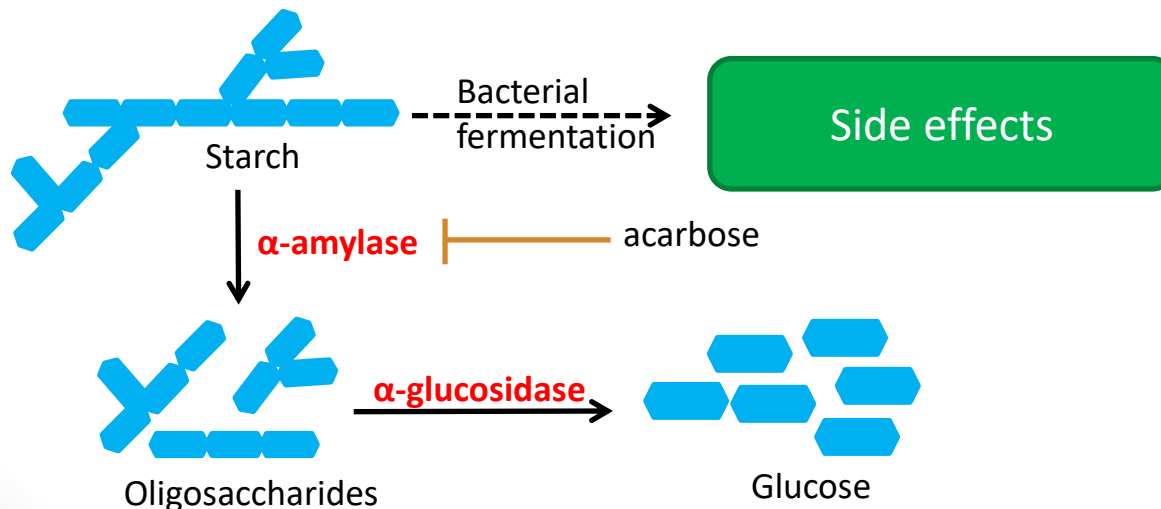
# High antioxidant capacity



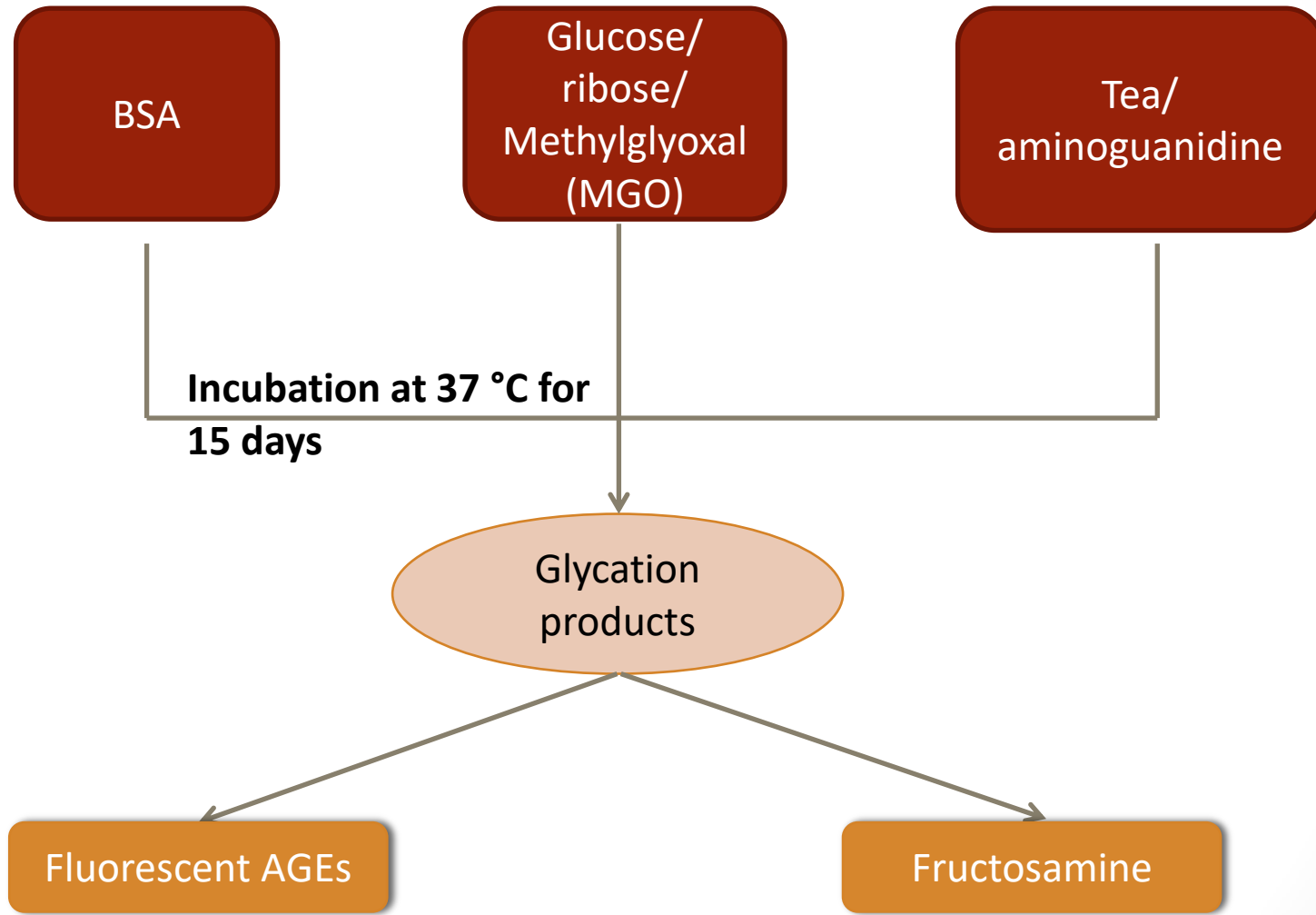
<i>In vitro</i> scavenging of	IC <sub>50</sub> (µg LP/mL)	
	Black tea	Green tea
ABTS <sup>·+</sup>	20.35 ± 0.30 <sup>b</sup>	12.18 ± 0.65 <sup>a</sup>
DPPH <sup>·</sup>	36.07 ± 1.93 <sup>b</sup>	19.94 ± 0.24 <sup>a</sup>
H <sub>2</sub> O <sub>2</sub>	700.99 ± 15.25 <sup>b</sup>	477.92 ± 20.47 <sup>a</sup>
NO <sup>·</sup>	19.32 ± 0.91 <sup>b</sup>	8.42 ± 0.44 <sup>a</sup>
O <sub>2</sub> <sup>·-</sup>	31.62 ± 0.75 <sup>b</sup>	18.29 ± 0.59 <sup>a</sup>
<i>In vitro</i> chelating of Fe <sup>2+</sup>	133.90 ± 2.37 <sup>a</sup>	253.97 ± 10.14 <sup>b</sup>

# Tea inhibits $\alpha$ -amylase and $\alpha$ -glucosidase activity

Sample	IC <sub>50</sub> ( $\mu$ g LP/mL)	
	$\alpha$ -amylase	$\alpha$ -glucosidase
Black tea	589.86 $\pm$ 39.51 <sup>b</sup>	72.31 $\pm$ 4.23 <sup>a</sup>
Green tea	947.80 $\pm$ 18.20 <sup>c</sup>	100.23 $\pm$ 8.10 <sup>b</sup>
Acarbose	1.78 $\pm$ 0.08 <sup>a</sup>	162.07 $\pm$ 4.66 <sup>c</sup>



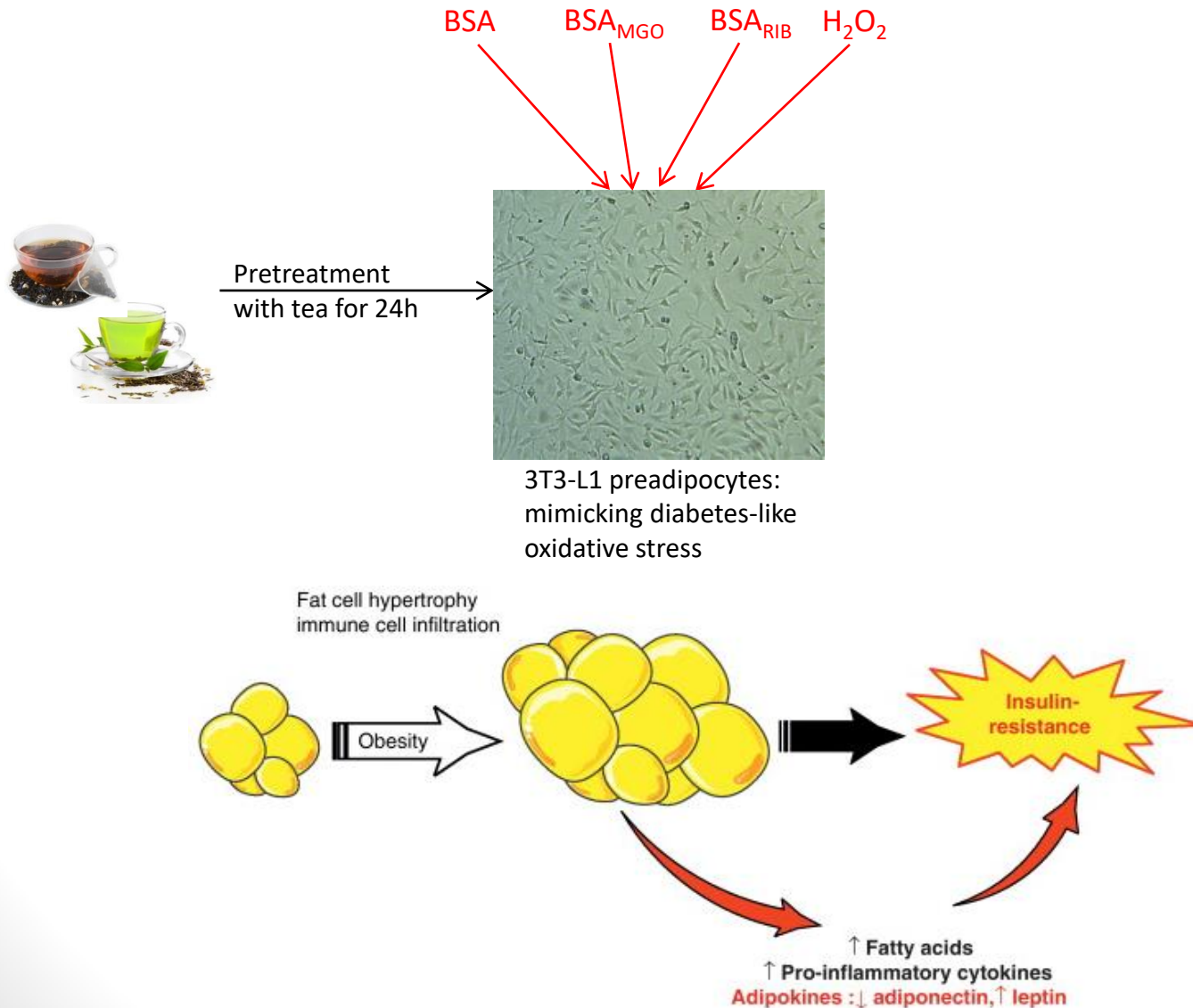
# Anti-glycative activity of tea



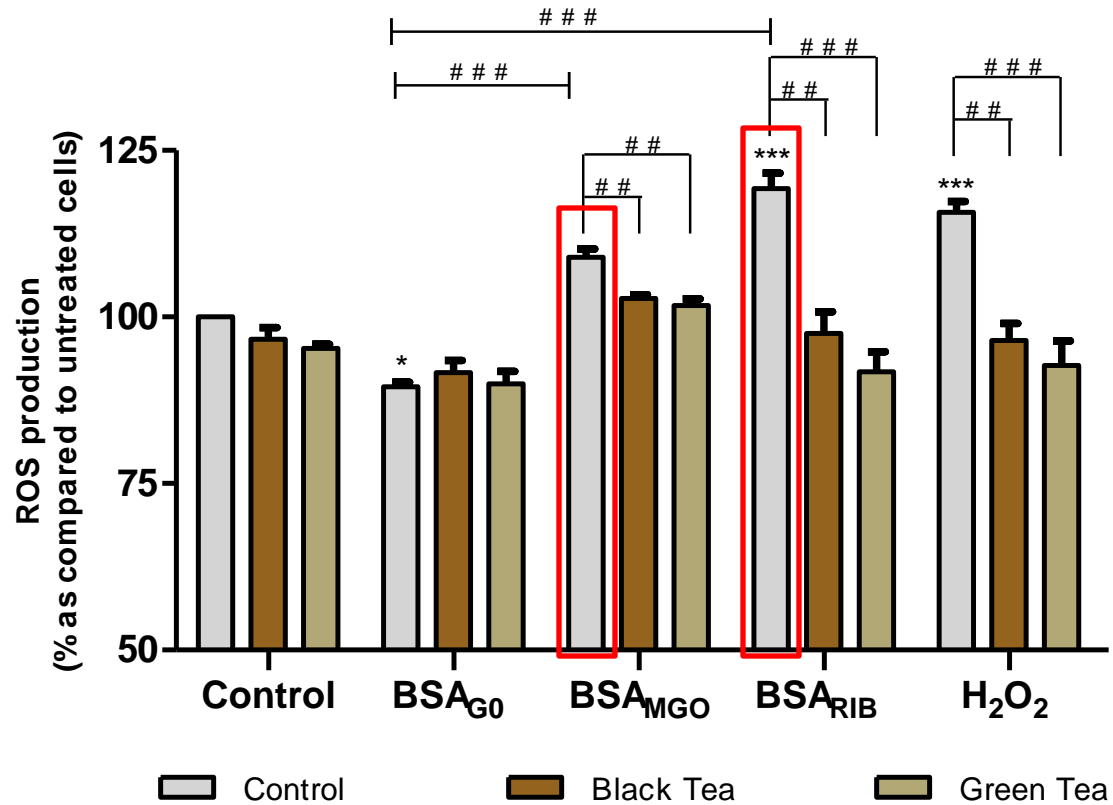
# Tea as an anti-glycating agent

Experimental group	Fluorescent AGEs level (% of BSA)	Fructosamine level (mM DMF)
BSA	100	0.711 ± 0.10
BSA + GLU + DMSO	176.21 ± 2.32 ***	4.97 ± 0.28 ***
BSA + GLU + black tea	114.98 ± 1.41 <sub>###</sub> ***	3.19 ± 0.19 <sub>##</sub> ***
BSA + GLU + green tea	111.63 ± 1.46 <sub>###</sub> ***	3.35 ± 0.18 <sub>###</sub> ***
BSA + GLU + aminoguanidine	103.46 ± 0.60 <sub>##</sub>	3.49 ± 0.26 <sub>##</sub> ***
BSA + RIB + DMSO	1346.69 ± 20.82 ***	4.86 ± 0.15 ***
BSA + RIB + black tea	126.35 ± 26.38 <sub>ooo</sub>	3.26 ± 0.33 <sub>oo</sub> ***
BSA + RIB + green tea	120.21 ± 16.97 <sub>ooo</sub>	3.35 ± 0.25 <sub>oo</sub> ***
BSA + RIB + aminoguanidine	114.85 ± 18.10 <sub>ooo</sub>	3.12 ± 0.25 <sub>oo</sub> ***
BSA + MGO + DMSO	1265.94 ± 45.33 ***	2.69 ± 0.29 ***
BSA + MGO + black tea	318.21 ± 23.76 <sub>φφφ</sub> ***	0.63 ± 0.18 <sub>φφφ</sub>
BSA + MGO + green tea	380.99 ± 12.14 <sub>φφφ</sub> ***	1.17 ± 0.28 <sub>φφ</sub>
BSA + MGO + aminoguanidine	308.19 ± 24.21 <sub>φφφ</sub> ***	0.91 ± 0.19 <sub>φφφ</sub>

# Protective effect of tea against oxidative stress & inflammation

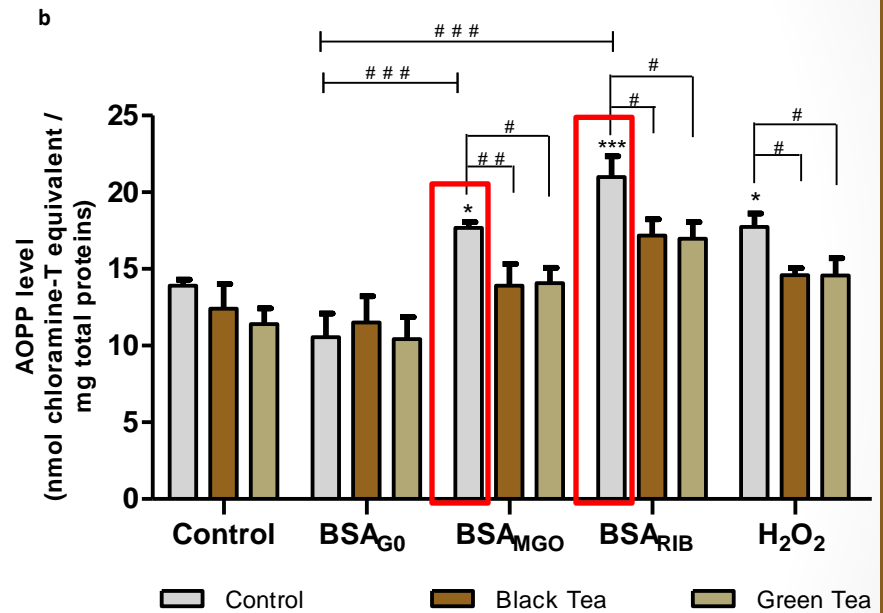
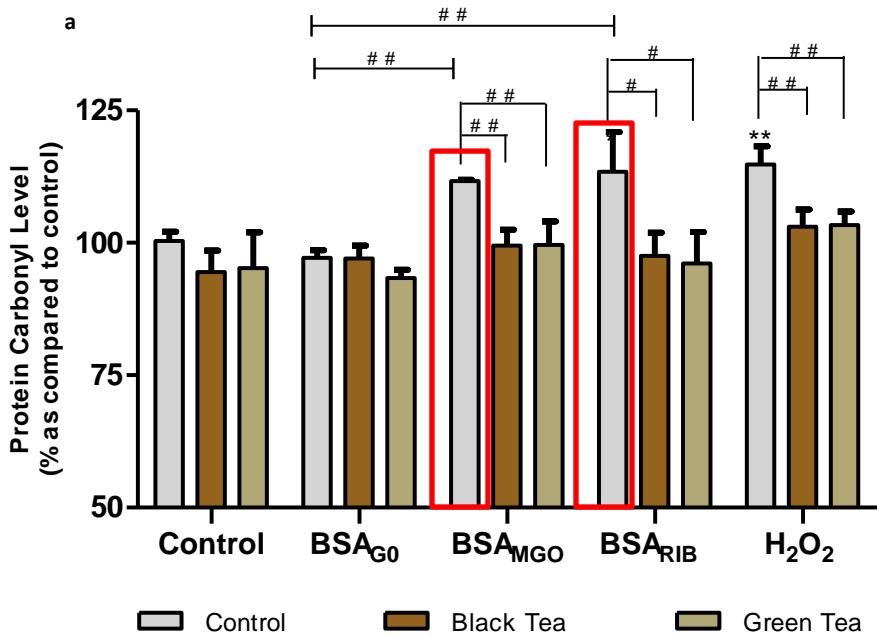


# Tea reduces ROS production



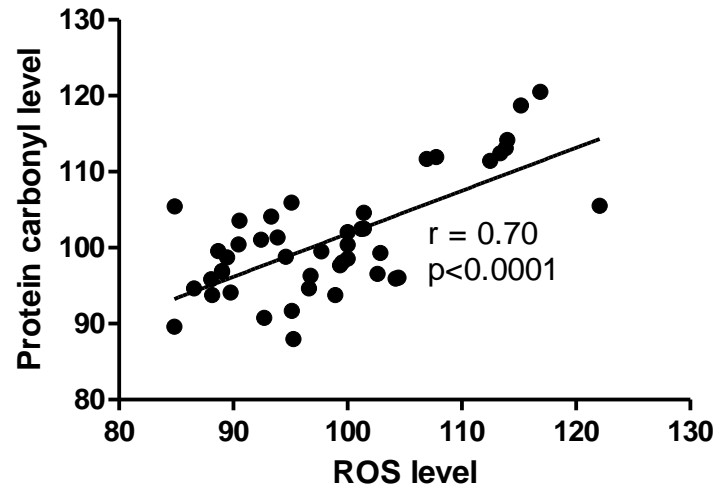


# Tea suppresses oxidative modification of proteins

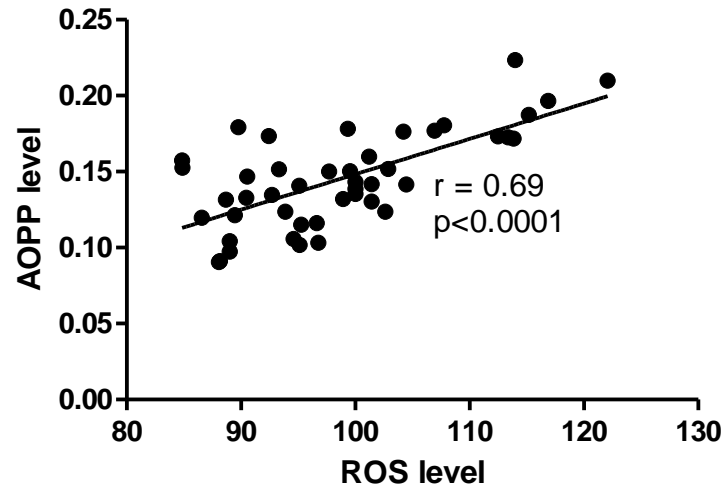


# Tea reduces oxidative modification of proteins

a

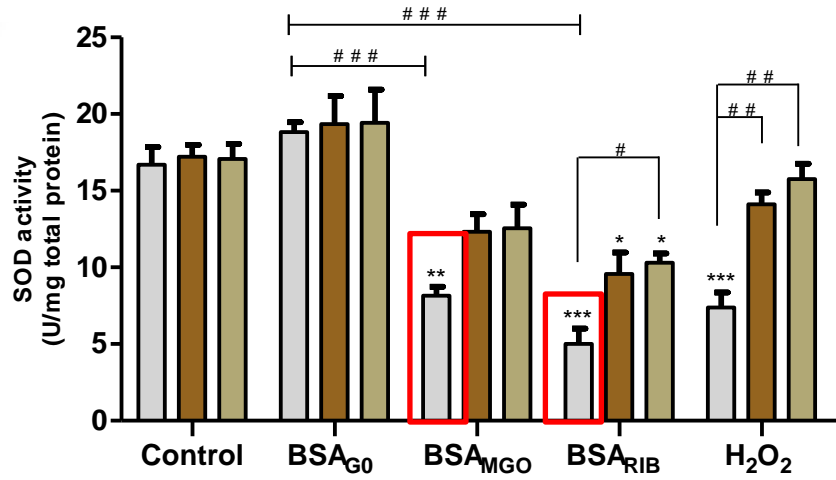


b

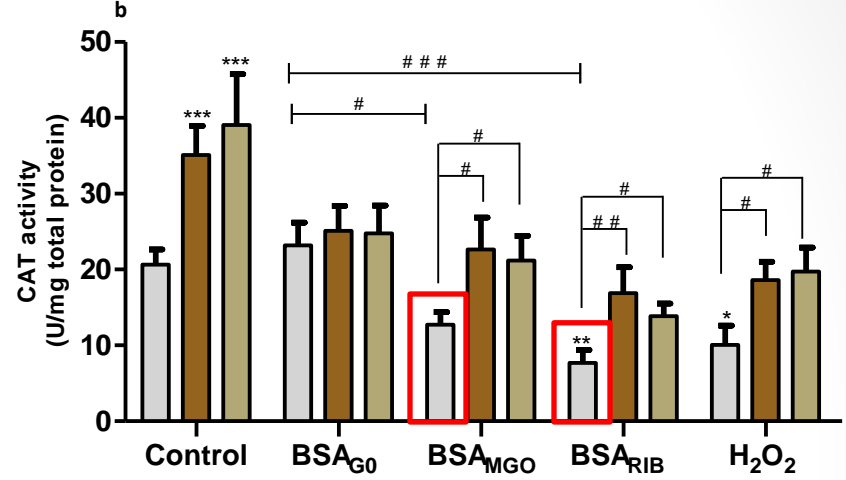


# Tea inhibits reduction of intrinsic antioxidant enzymatic activity

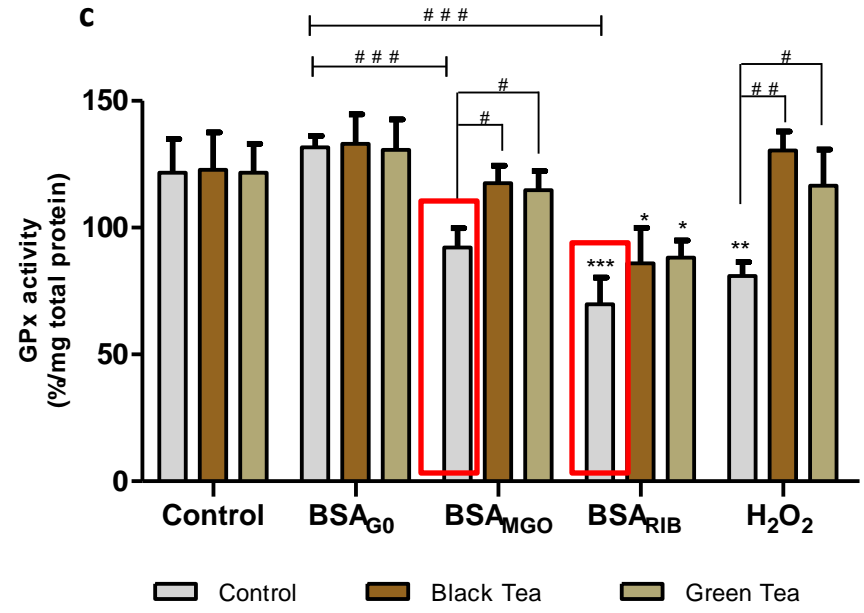
a



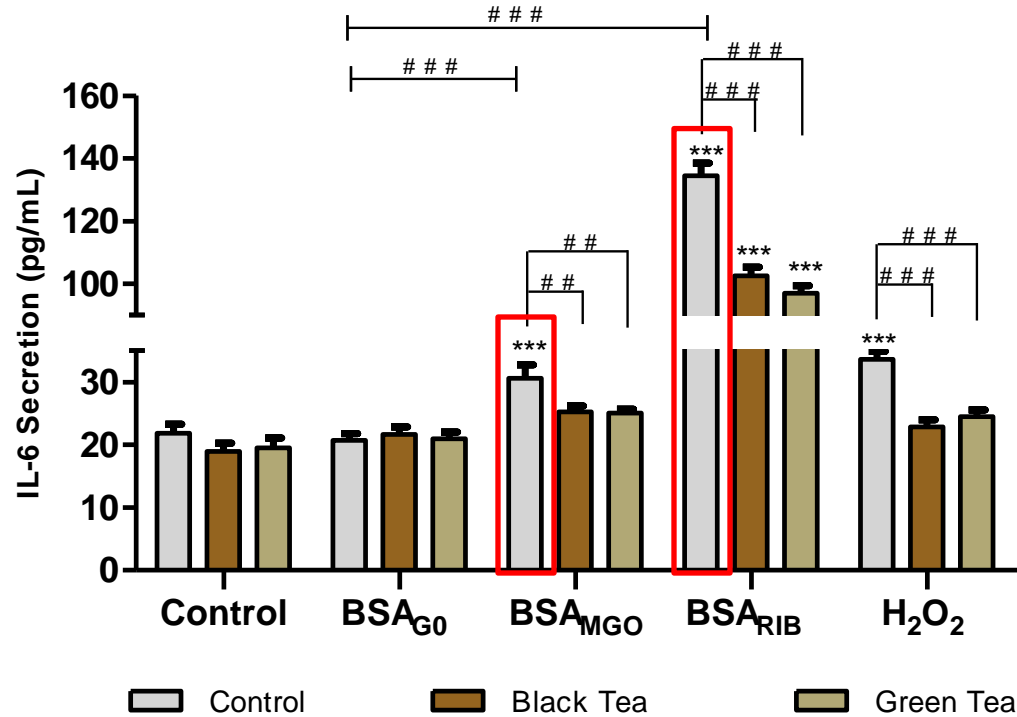
b



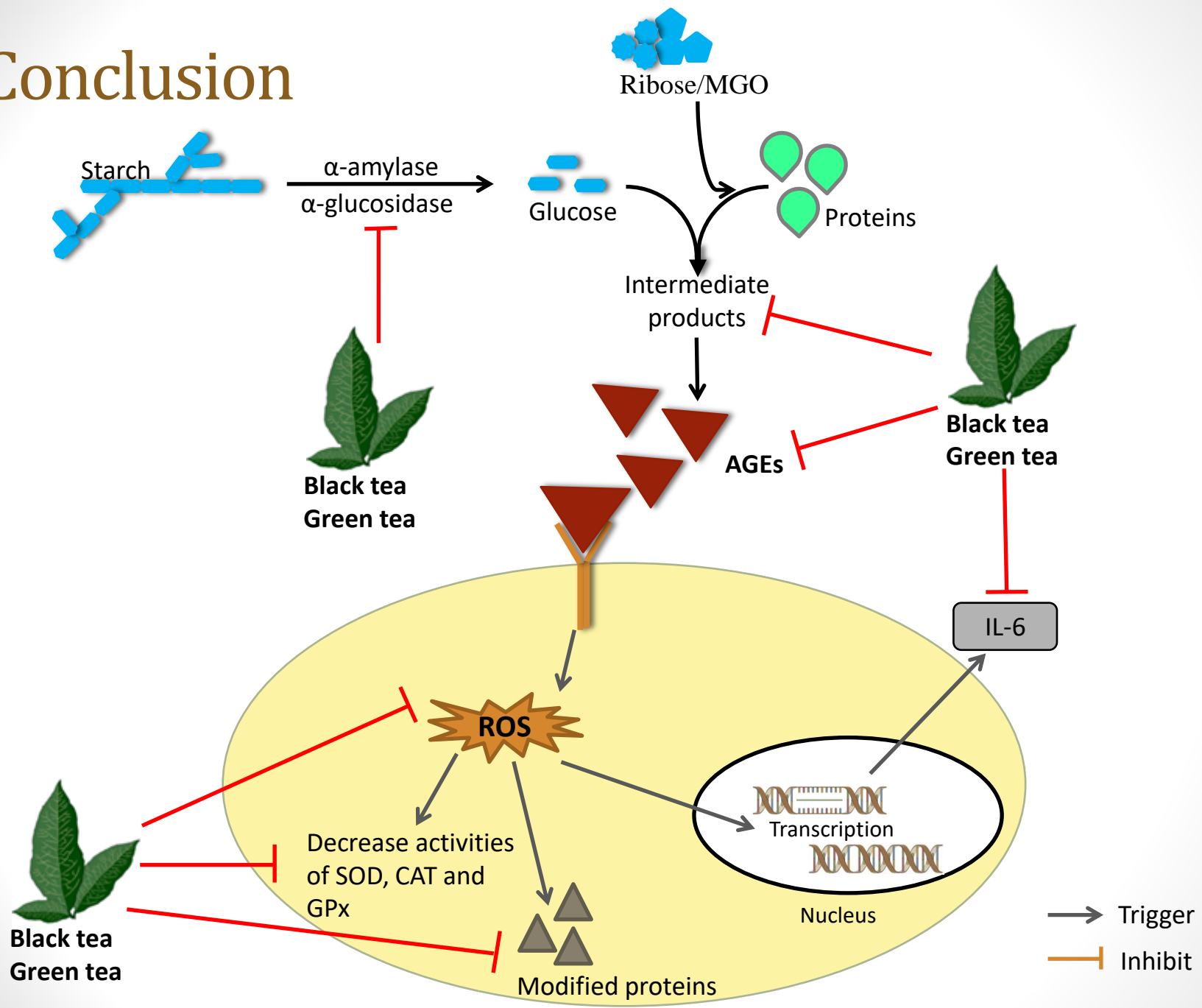
c



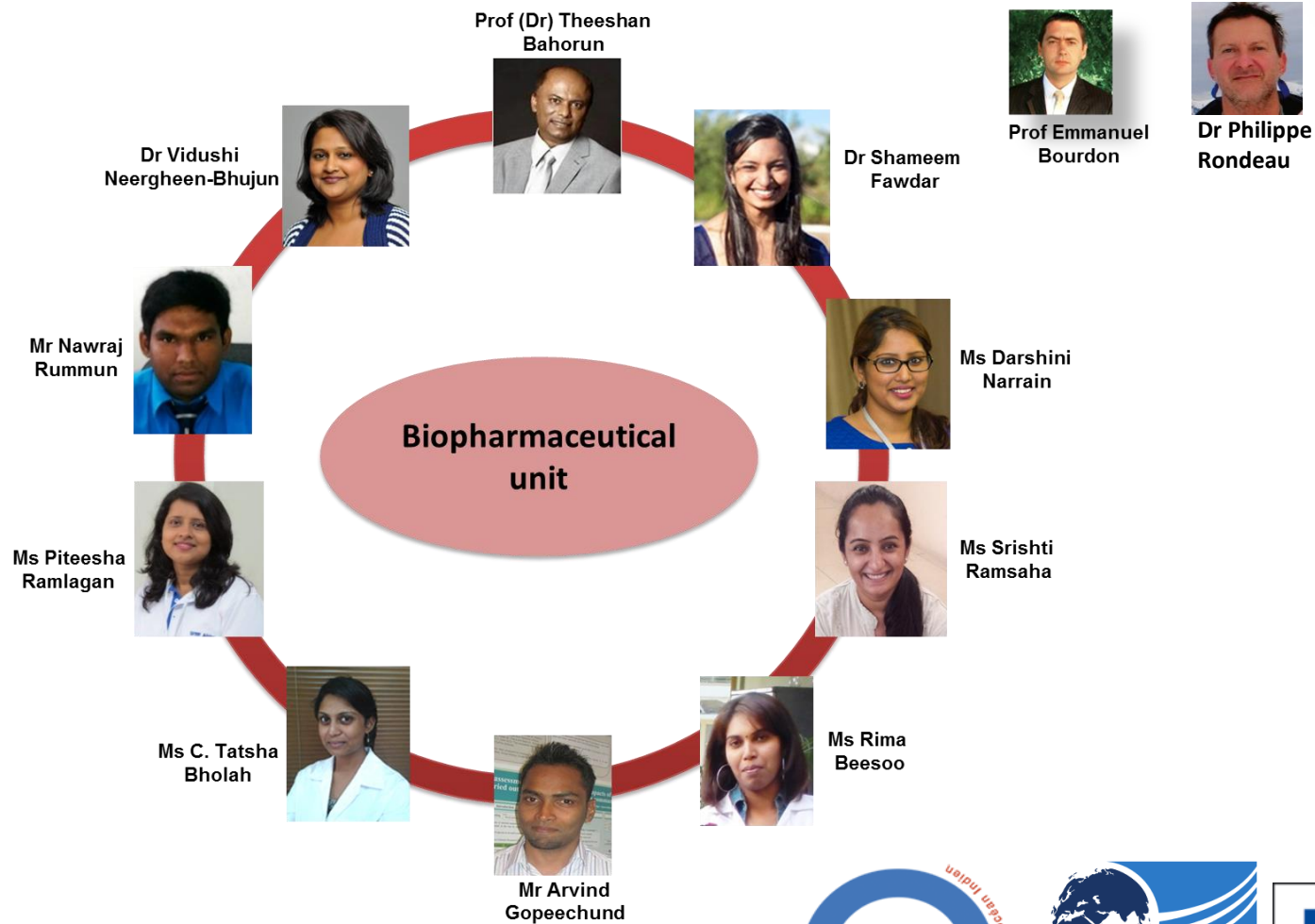
# Tea exerts anti-inflammatory role



# Conclusion



# Acknowledgement



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A white oval dish is divided into two sections. The left section contains green tea leaves, which are small, dark green, and appear to be rolled or twisted. The right section contains dark tea leaves, which are larger, dark brown to black, and appear to be more loosely rolled or broken. The text "Thank you" is written in a red, cursive font across the center of the dish.

*Thank you*