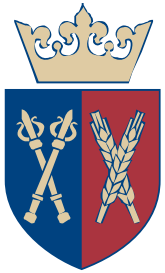
# Changes of NFκB activity in hyperglycemic piglet adipose tissue

**Joanna Zubel-Łojek, Krystyna Pierzchała-Koziec, Ewa Ocłoń, Anna Latacz**



Department of Animal Physiology and Endocrinology
University of Agriculture
Krakow, Poland
www.ur.krakow.pl
e-mail: rzkoziec@cyf-kr.edu.pl

**EAAP Warsaw 2015**

# NF-κB

**nuclear factor kappa-light-chain-enhancer of activated B cells**
is a protein complex that controls:

- transcription of DNA,
- cytokine production,
- cell survival.

# NFkB Signaling Pathway

The pathway is activated by a variety of stimuli including:

- cellular stress,
- cytokines,
- free radicals,
- UV radiation,
- oxidized LDL,
- bacterial/viral infection.

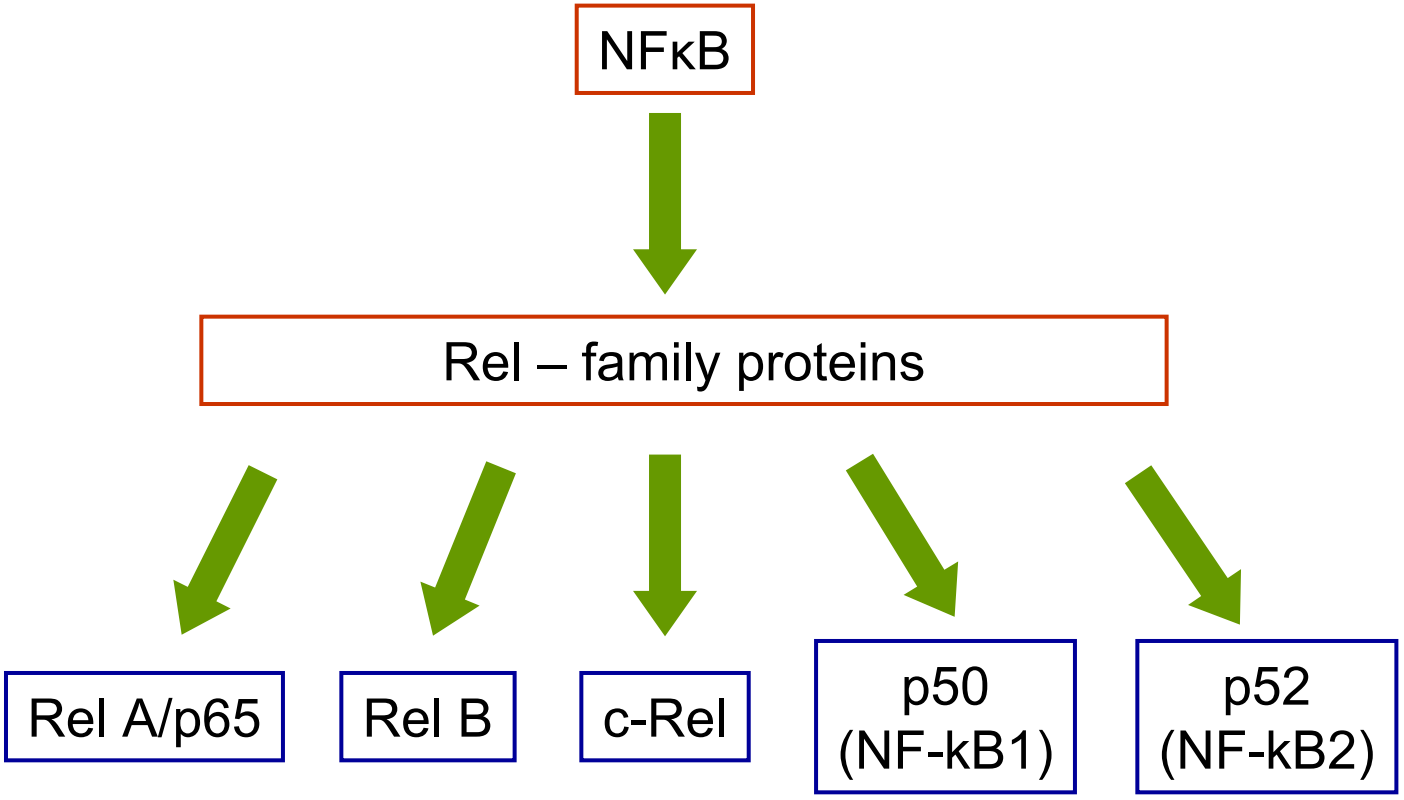
# NF-κB pathway

- Activation
- Translocation to the nucleus
- Binding to DNA responses elements
- Recruitments of RNA polymerase
- Other coactivators,
- DNA-RNA
- Protein synthesis.

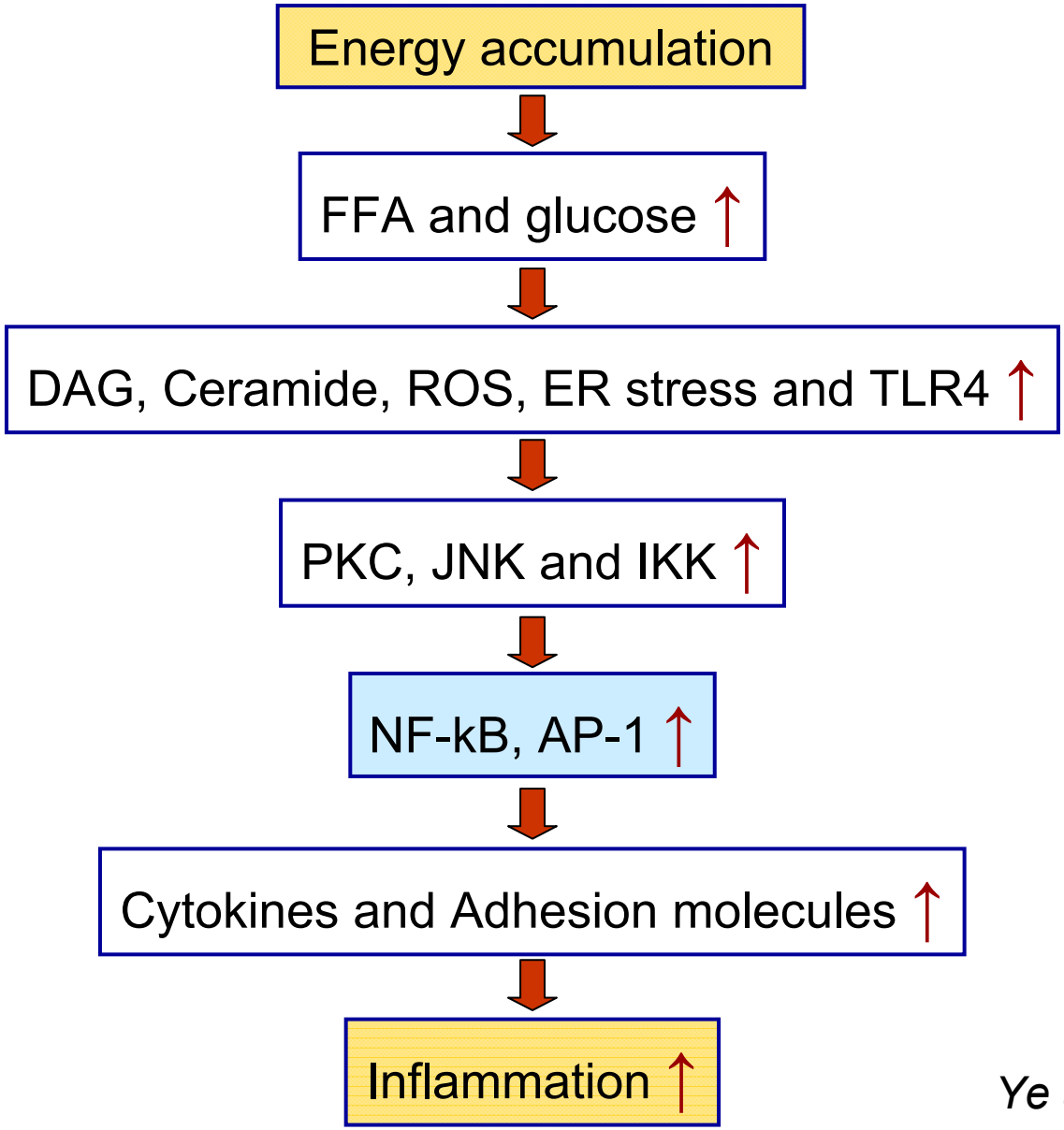
# NF-κB key role

- regulating the immune response to infection (κ light chains are critical components of immunoglobulins).
  - linked to cancer,
  - inflammatory,
  - autoimmune diseases,
  - septic shock,
  - viral infection,
  - improper immune development,
  - synaptic plasticity and memory.

# Family of NFkB



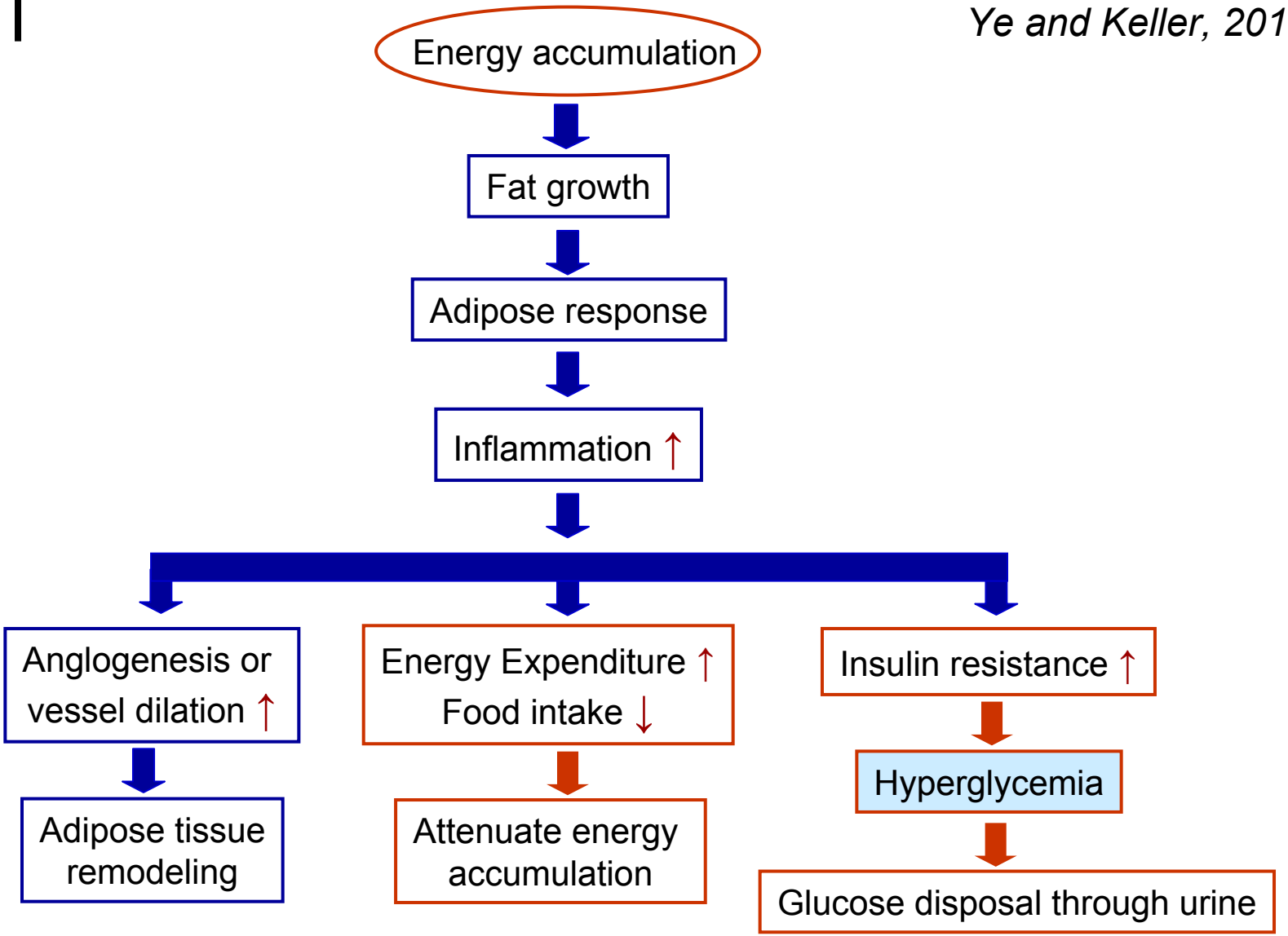
# Energy accumulation induces inflammation

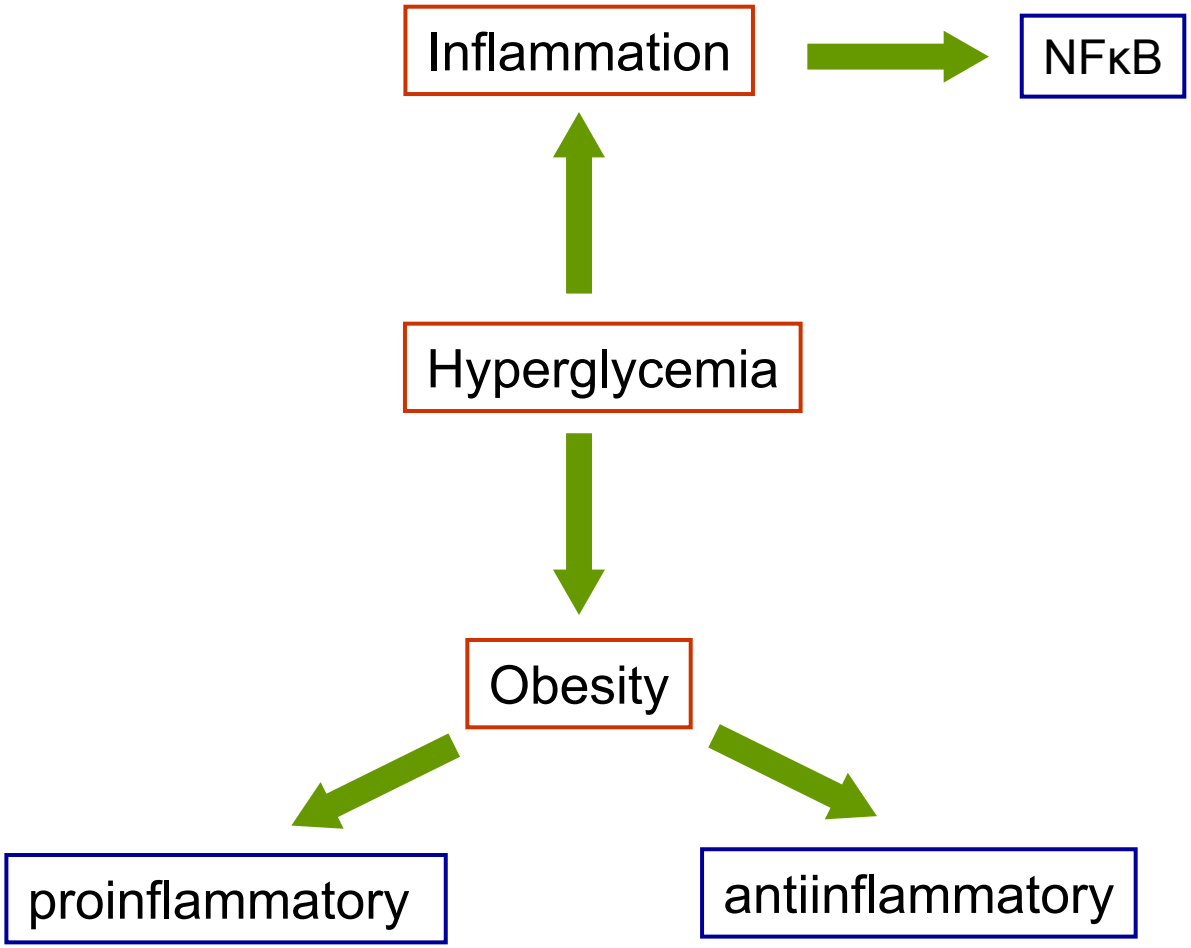



*Ye and Keller, 2010*

# Inflammation in obesity

*Ye and Keller, 2010*




Inflammation
NFκB
Hyperglycemia
Obesity
proinflammatory
antiinflammatory

# The aim of the study

The aim of the study was to estimate the effect of hyperglycemia on the:

- expression,
- concentration
- and secretion

of NFκB from visceral adipose tissue after pro- and antiinflammatory factors treatment.

# Animals

- **Piglets:** Polish landrace
- **Age:** 10 weeks old
- **n = 18**

# Groups

- Control (n = 6)
- Streptozotocin treated – STZ
- Steroid treated – S

# Treatment

- **Control:** injections of 0,9% NaCl (i.m.)
  day: 1, 2, 3, 5

- **STZ:** injections (i.m.) of
  streptozotocine 150 mg/piglet
  days: 1st (75 mg), 2nd (50 mg),
  3rd (25 mg)

- **Steroid:** injections (i.m.) of prednisolone
  60 mg/piglet
  days: 1st (10 mg), 2nd (20 mg),
  3rd (30 mg)

- **Day 5:** Separation of adipose tissue
  Blood

# Materials

- Blood – plasma
- Adipose tissue → incubation media
  - → freeze -80°C
  - → RNA later

# Analysis

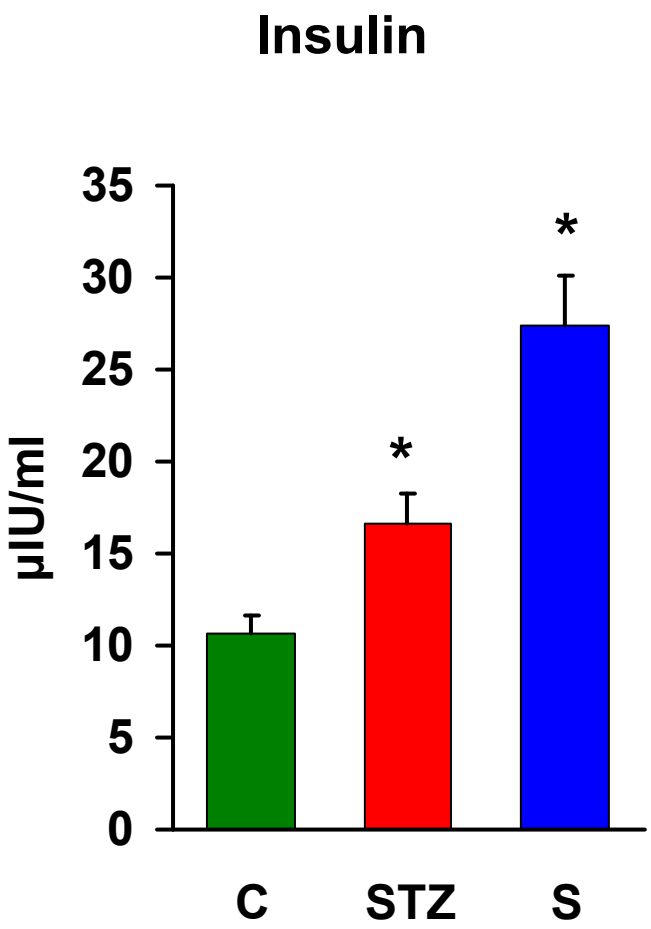
- NFκB → ELISA
  - concentration in tissue
  - incubation media

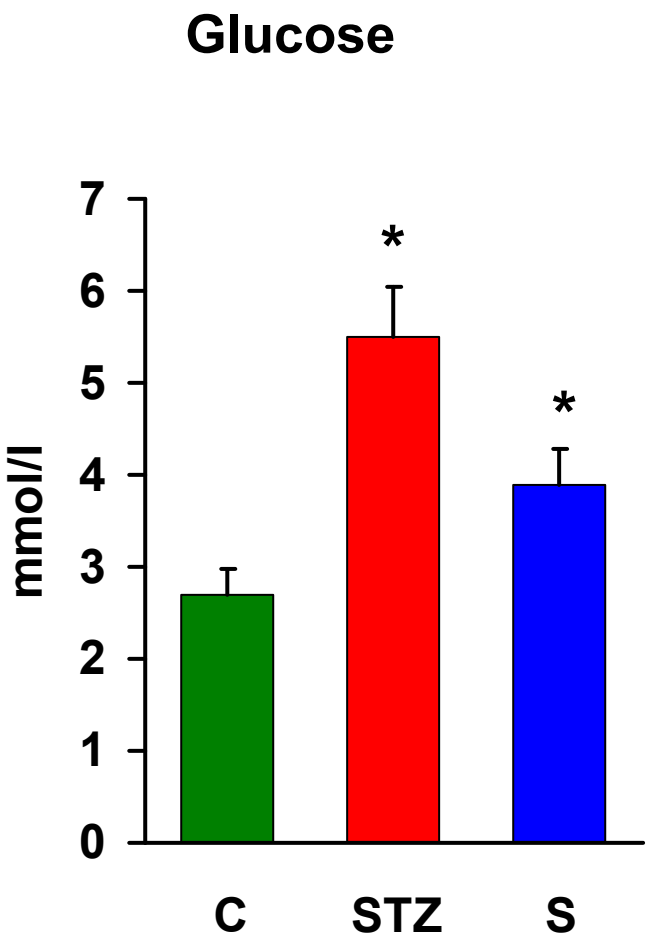
    Resistin, Visfatin, IL-6, TNFα, CRP
- Insulin, cortisol → RIA
- Glucose, triglycerides, cholesterol → commercial tests

# mRNA expression

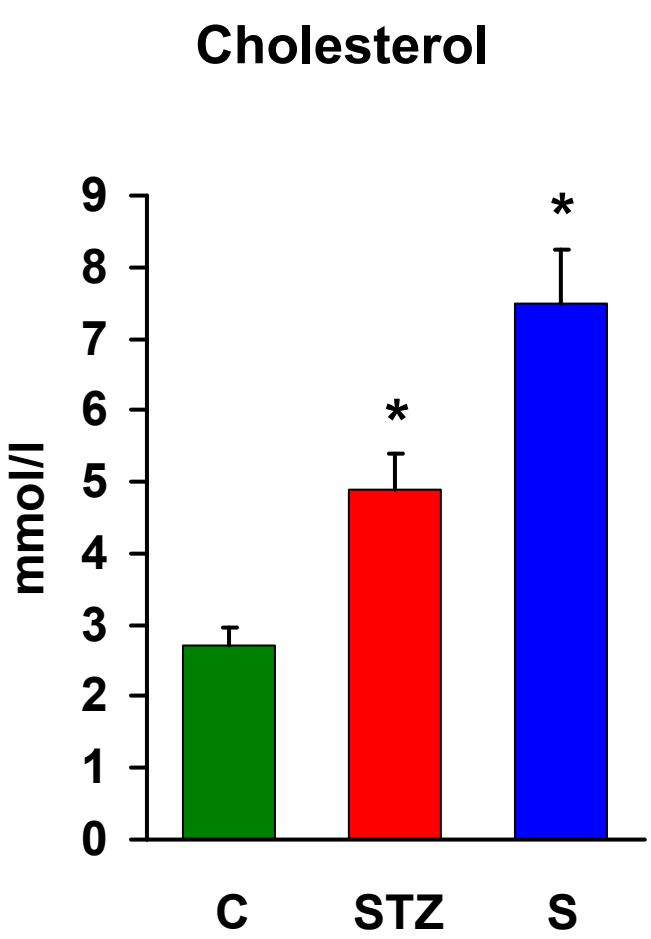
- NFκB
- Resistin
- Visfatin
- Adiponectin

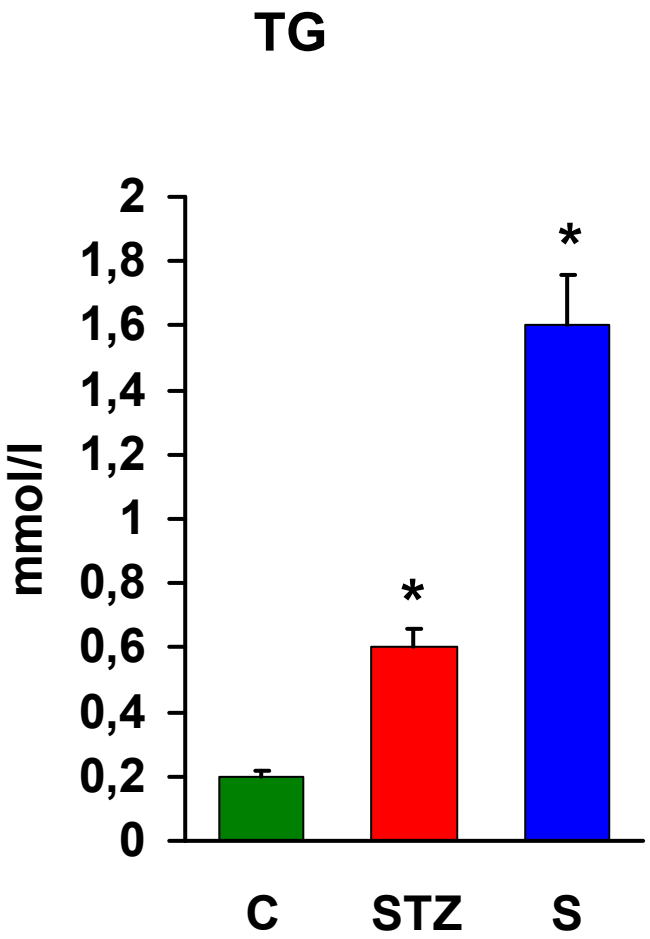
# I. Glucose metabolism



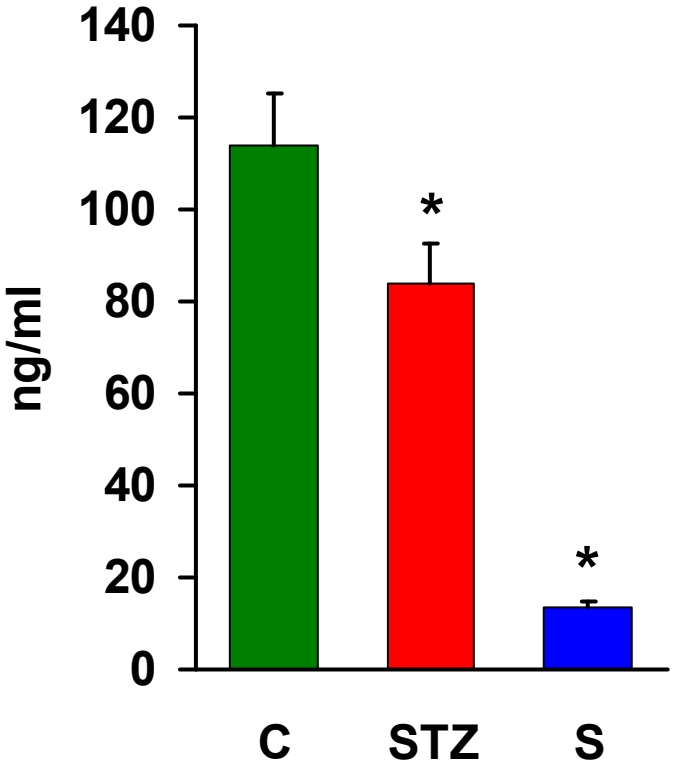



# II. Lipids

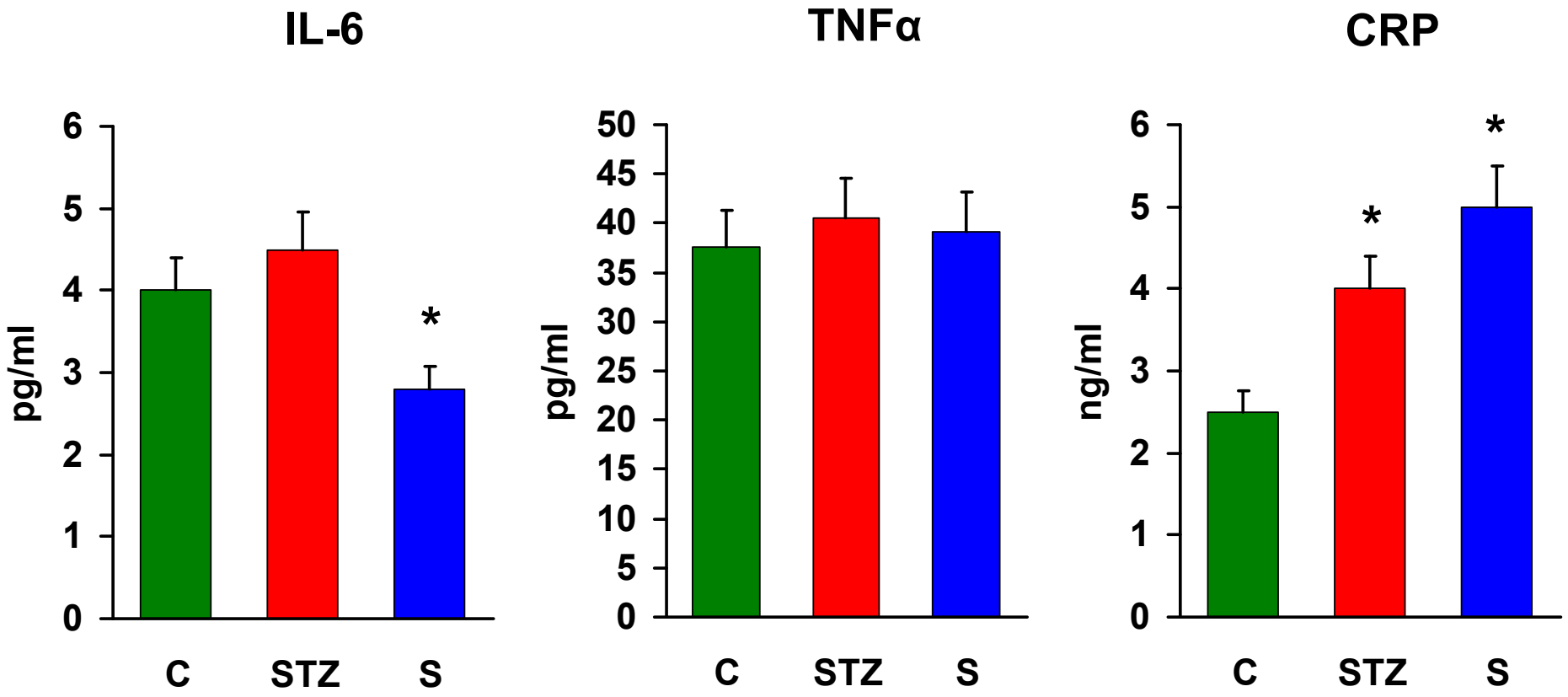

Cholesterol
mmol/l
9
8
7
6
5
4
3
2
1
0
*
*
C
STZ
S

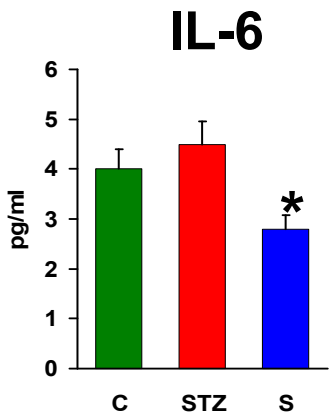

TG
mmol/l
2
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
*
*
C
STZ
S

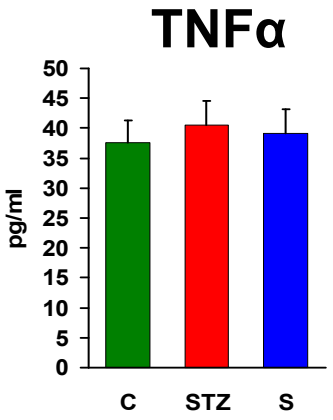
# III. Cortisol

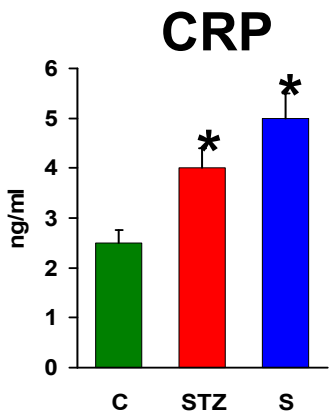


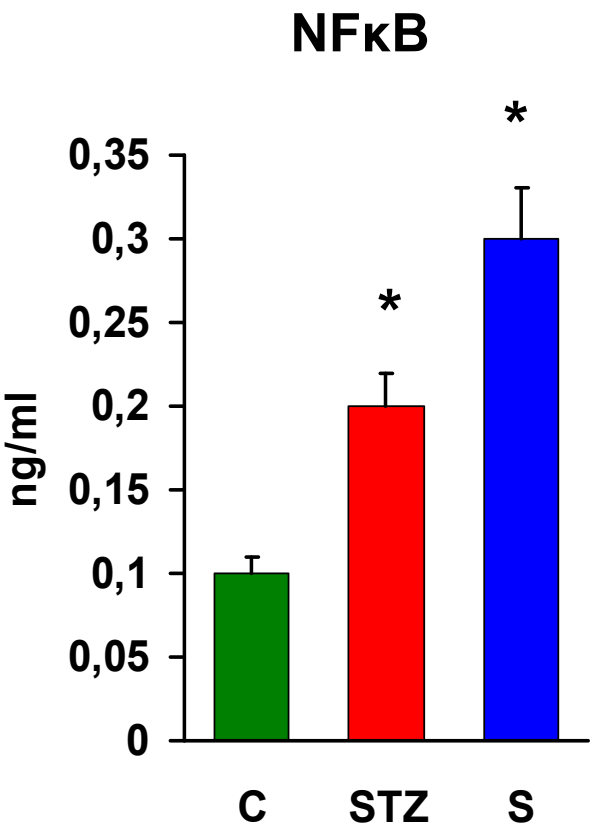
# IV. Immune system parameters in blood



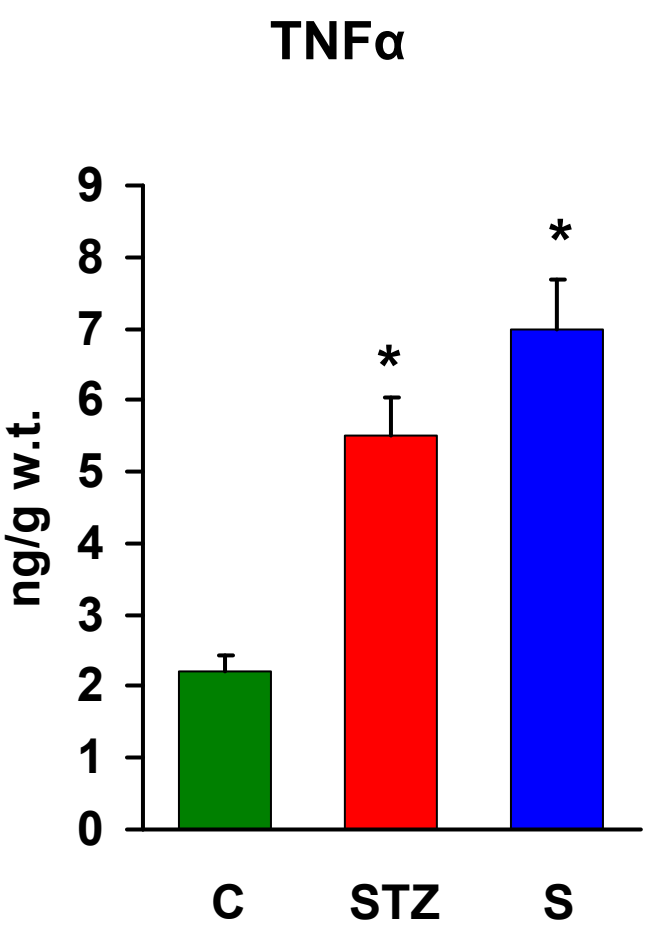

IL-6
pg/ml
6
5
4
3
2
1
0
*
C
STZ
S

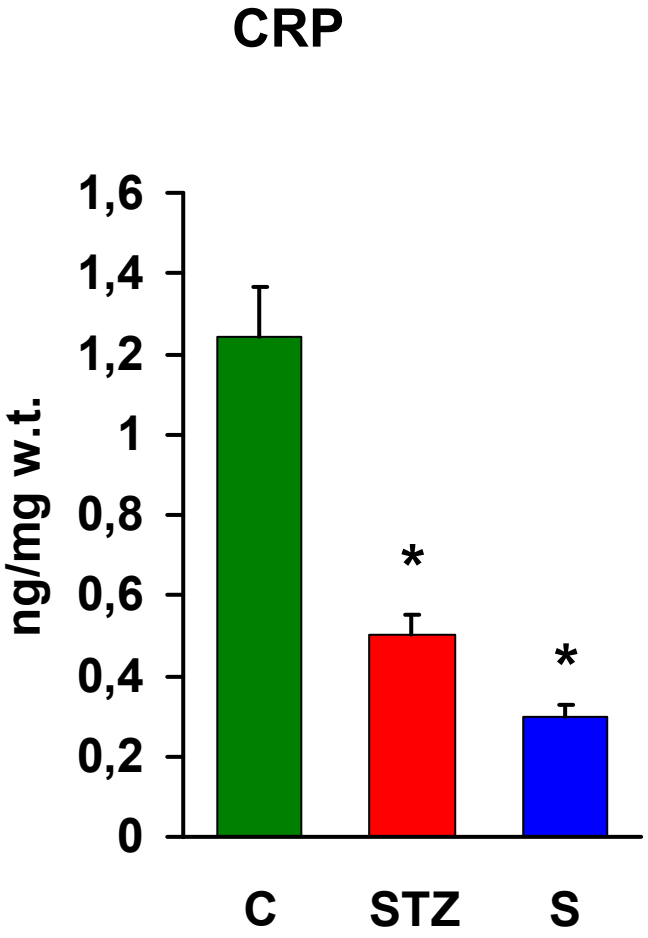

TNFα
pg/ml
50
45
40
35
30
25
20
15
10
5
0
C
STZ
S


CRP
ng/ml
6
5
4
3
2
1
0
*
*
C
STZ
S

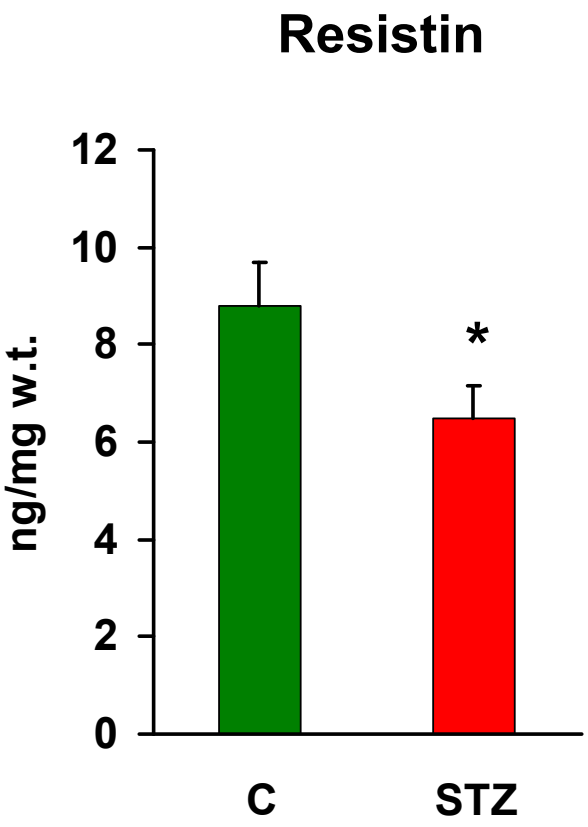

NFκB
ng/ml
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
*
*
C
STZ
S

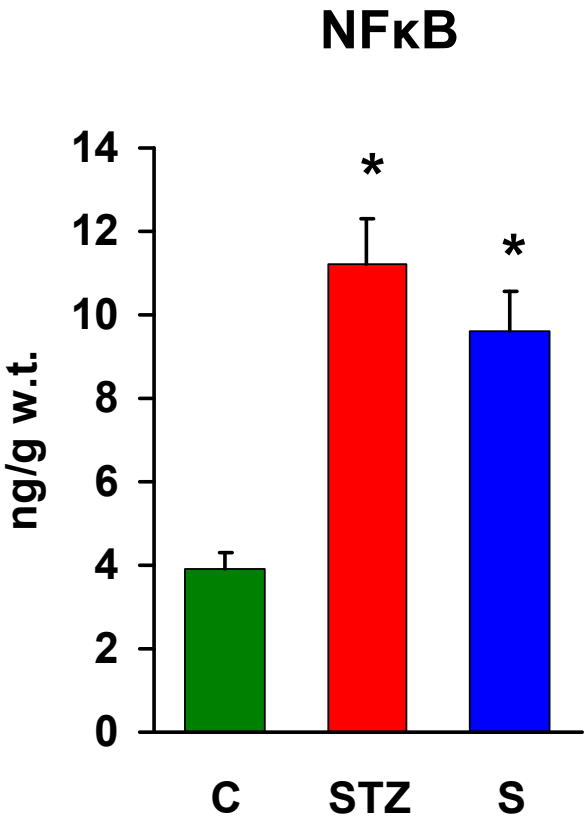
# V. Adipose tissue immune parameters

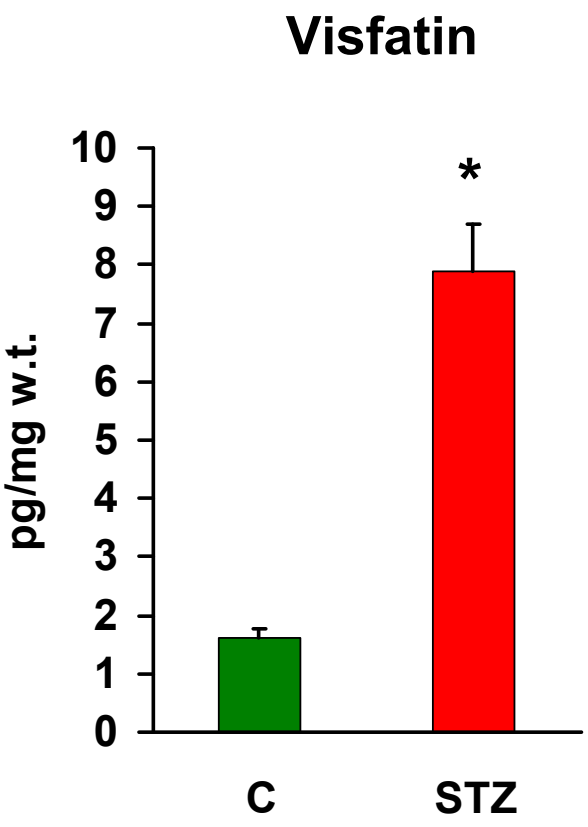


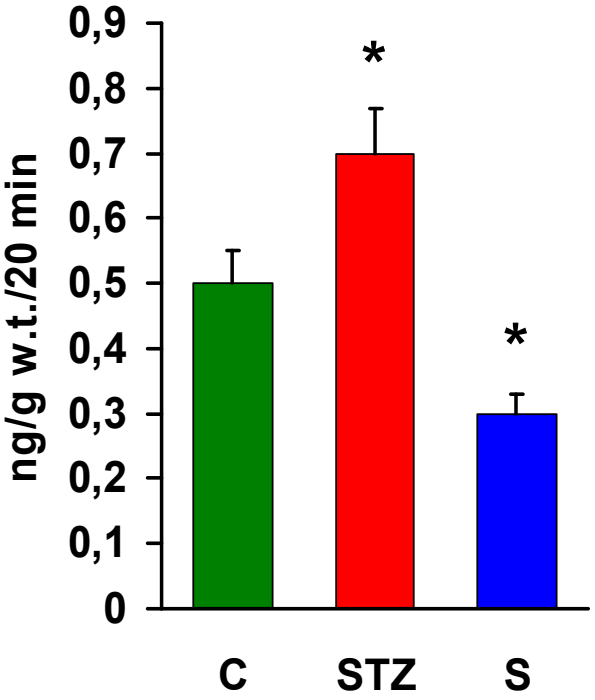
# Adipose tissue



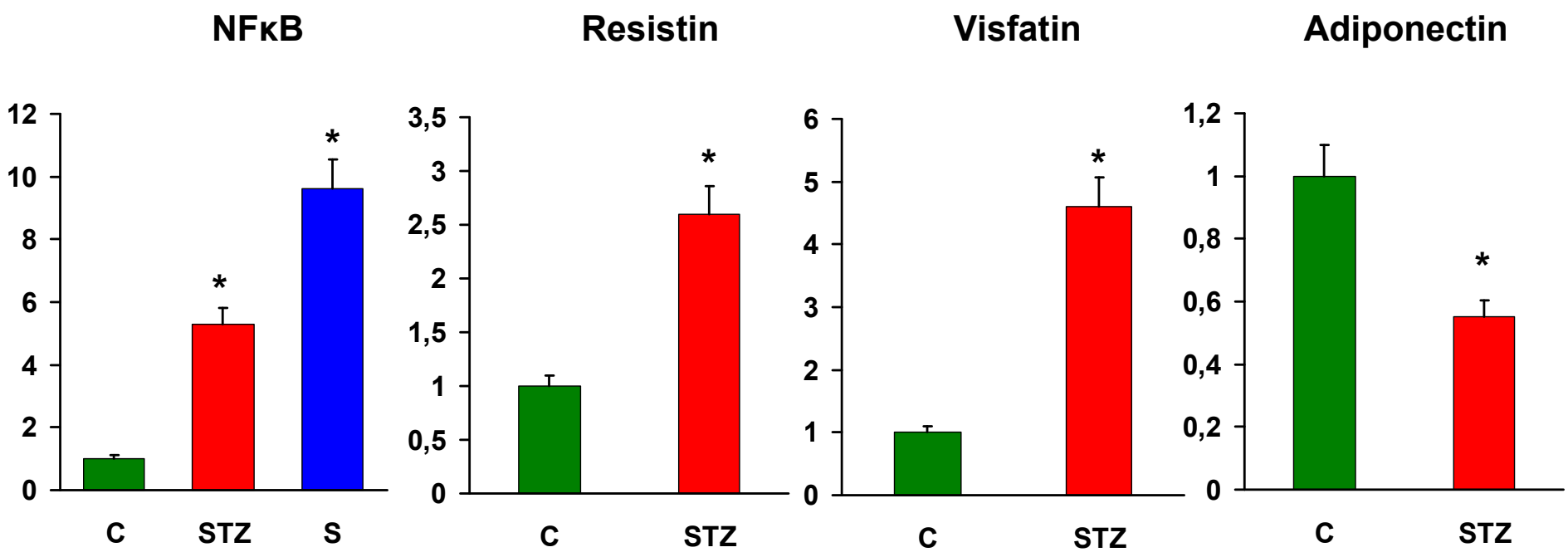



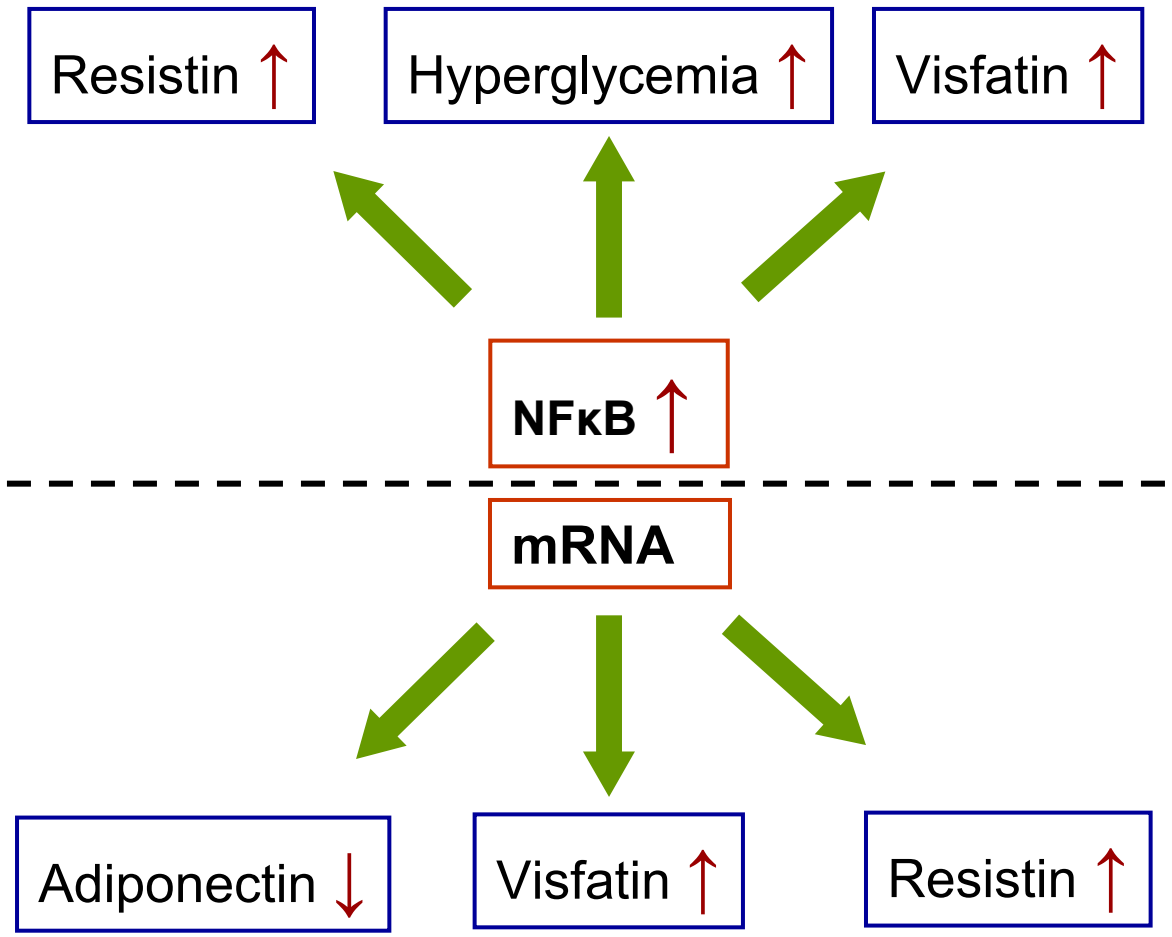



# NFκB secretion from adipose tissue



# [RG]/18sRNA


NFκB
12
10
8
6
4
2
0
*
*
C
STZ
S
Resistin
3,5
3
2,5
2
1,5
1
0,5
0
*
C
STZ
Visfatin
6
5
4
3
2
1
0
*
C
STZ
Adiponectin
1,2
1
0,8
0,6
0,4
0,2
0
*
C
STZ


Resistin ↑
Hyperglycemia ↑
Visfatin ↑
NFκB ↑
mRNA
Adiponectin ↓
Visfatin ↑
Resistin ↑

# Conclusions

- NFκB is an important factor regulating the synthesis and activity of immune cytokines at the tissue area and cell levels in hyperglycemic piglets.
- Physiological visceral adipose tissue plays important role in the modulation of inflammation state during hyperglycemia.

# Acknowledgements


- mgr Beata Morawska DRUKARNIA KNOW-HOW