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EFFECT OF SIX WEEKS OF SWIMMING TRAINING ON FGF-21 AND PNPLA-3 GENES EXPRESSION IN RATS WITH PCOS

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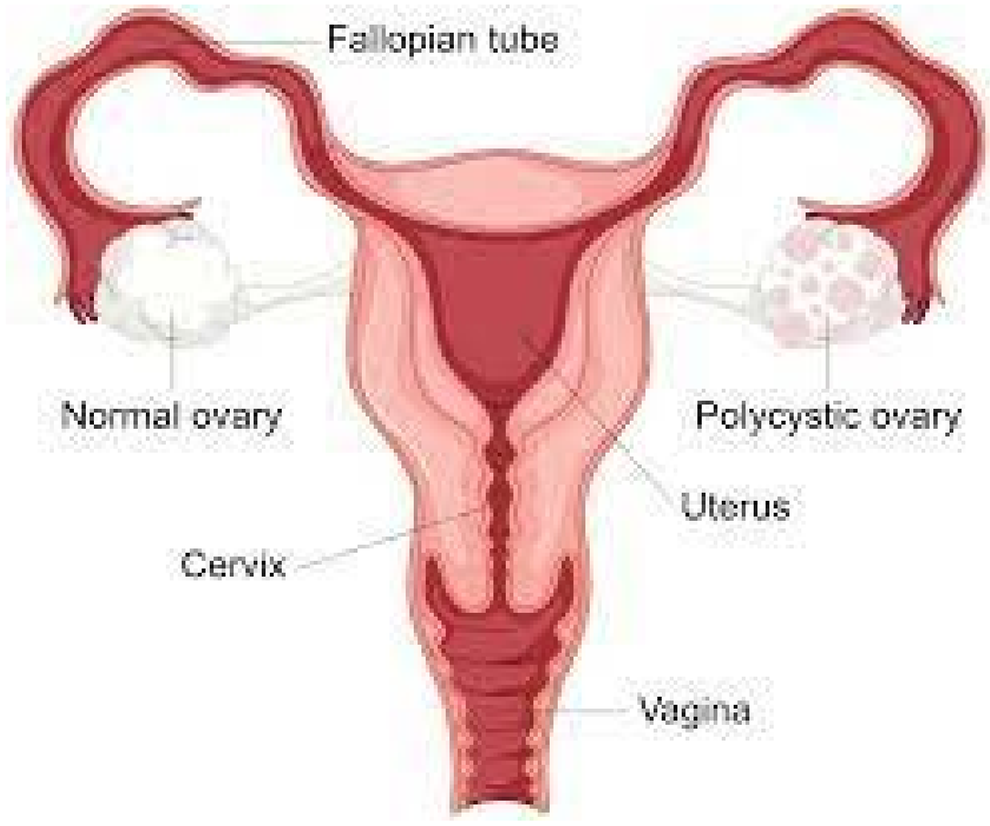
INTRODUCTION

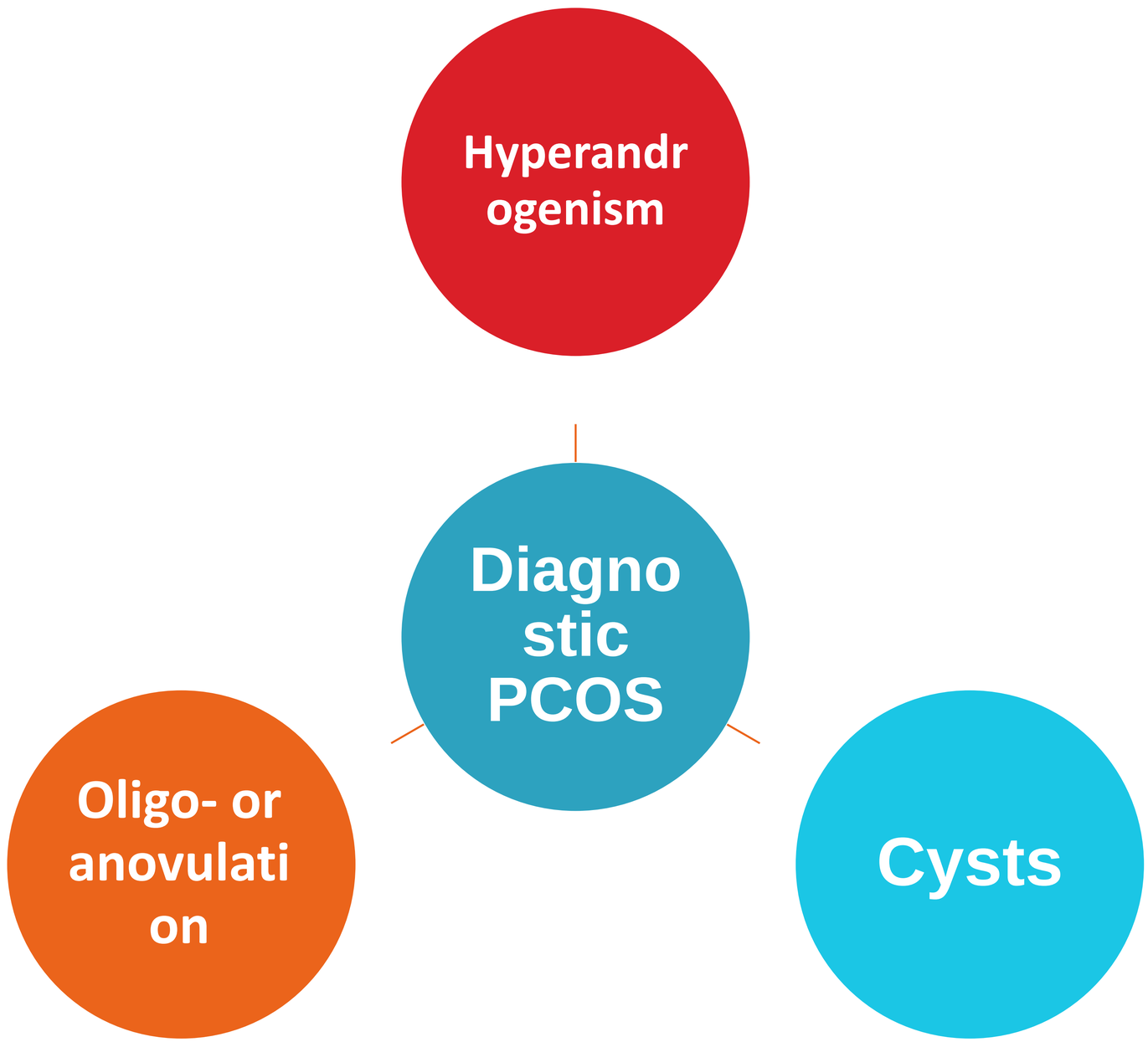


Polycystic ovary syndrome (PCOS) is most common endocrine disorder reproductive age, affecting 15–20% women.

Stein and Leventhal initially described it in 1935.

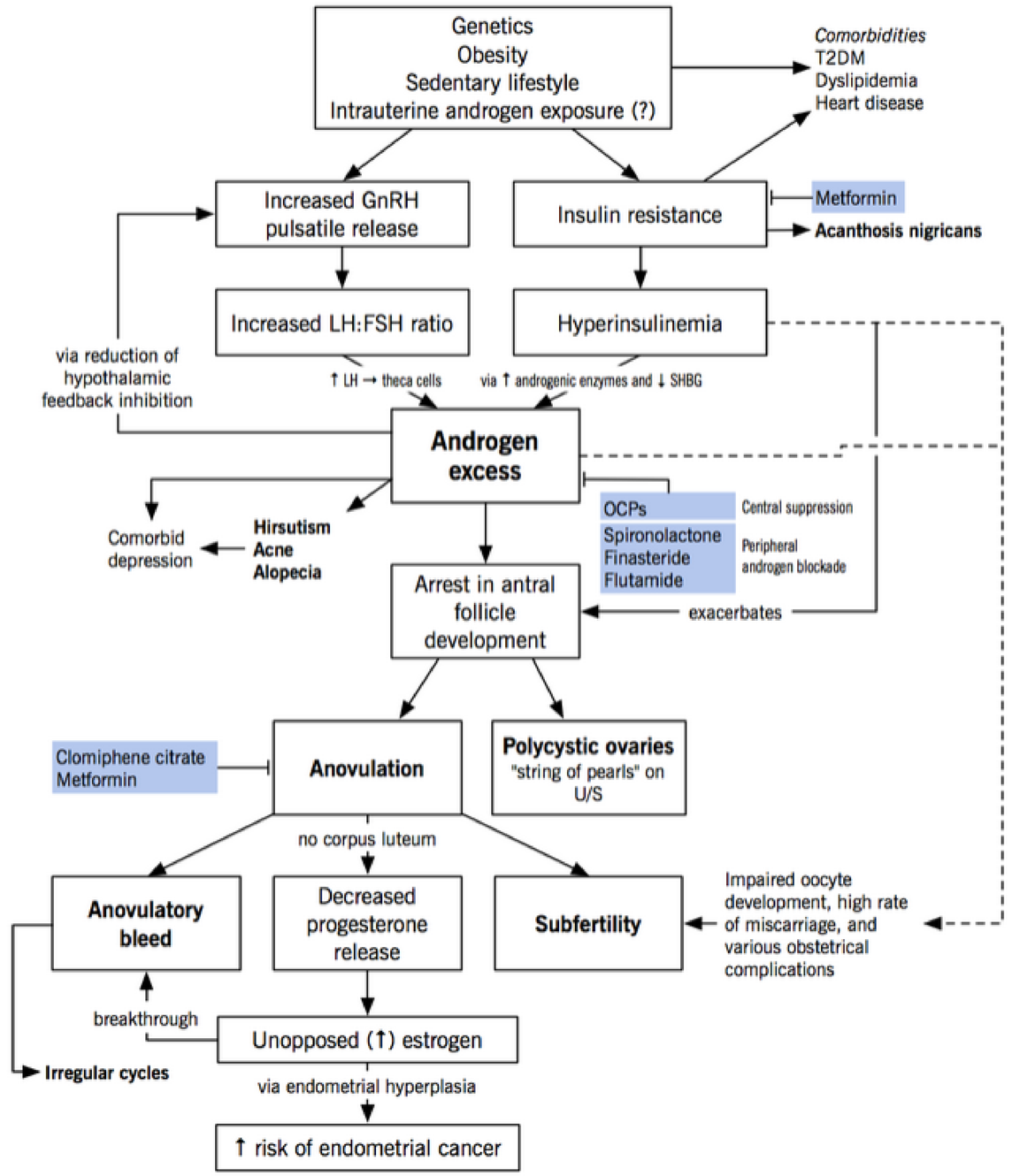
Prevalence of PCOS Iran: 11.7%

Rotterdam: 14.4


Hyperandr ogenism
Diagno stic PCOS
Oligo- or anovulati on
Cysts

Pathophysiology of PCOS

Alex Rotstein, Ragini Srinivasan, and Eric Wong

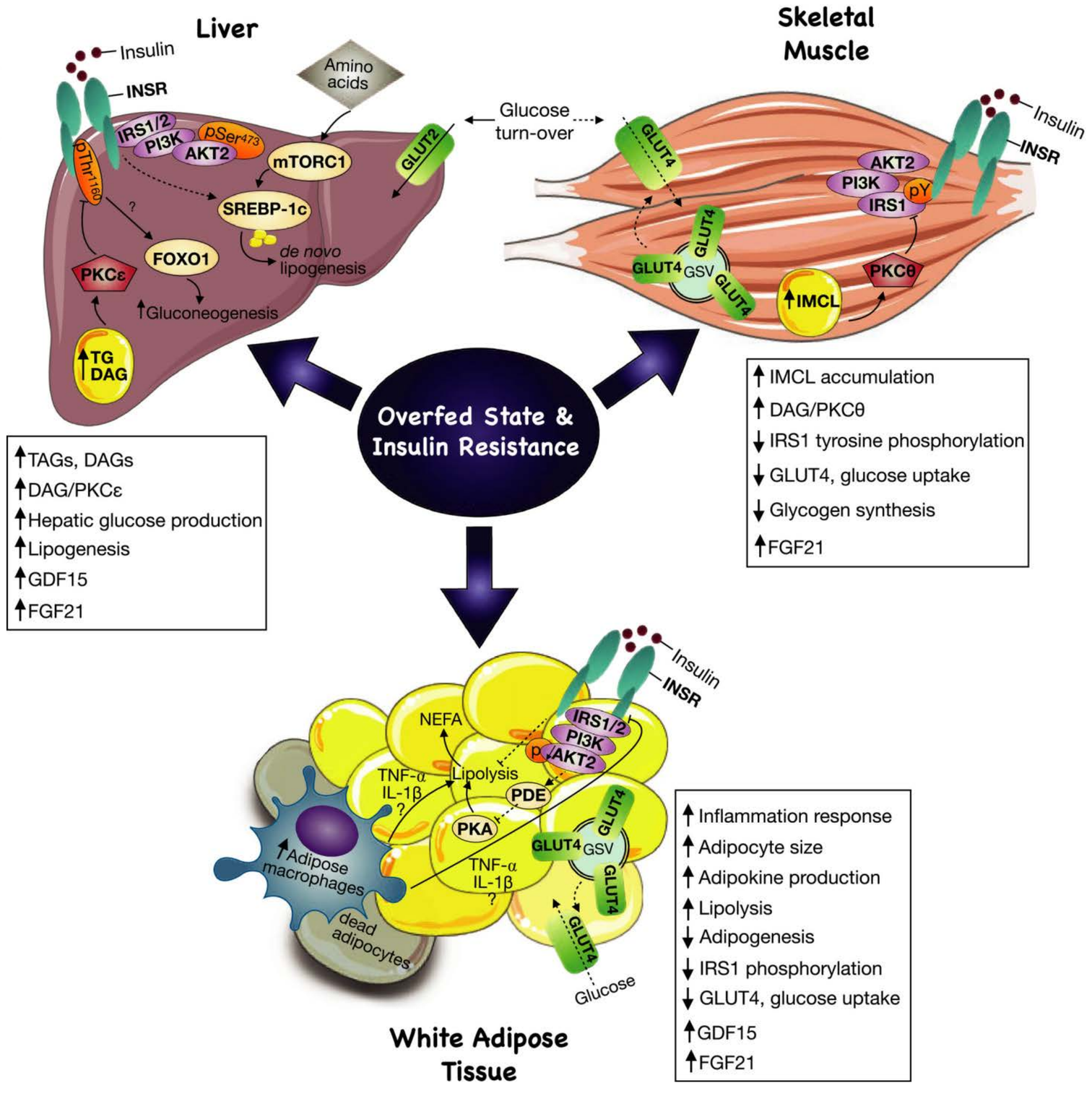


65-90% PCOS FAT
25-45% PCOS not fat

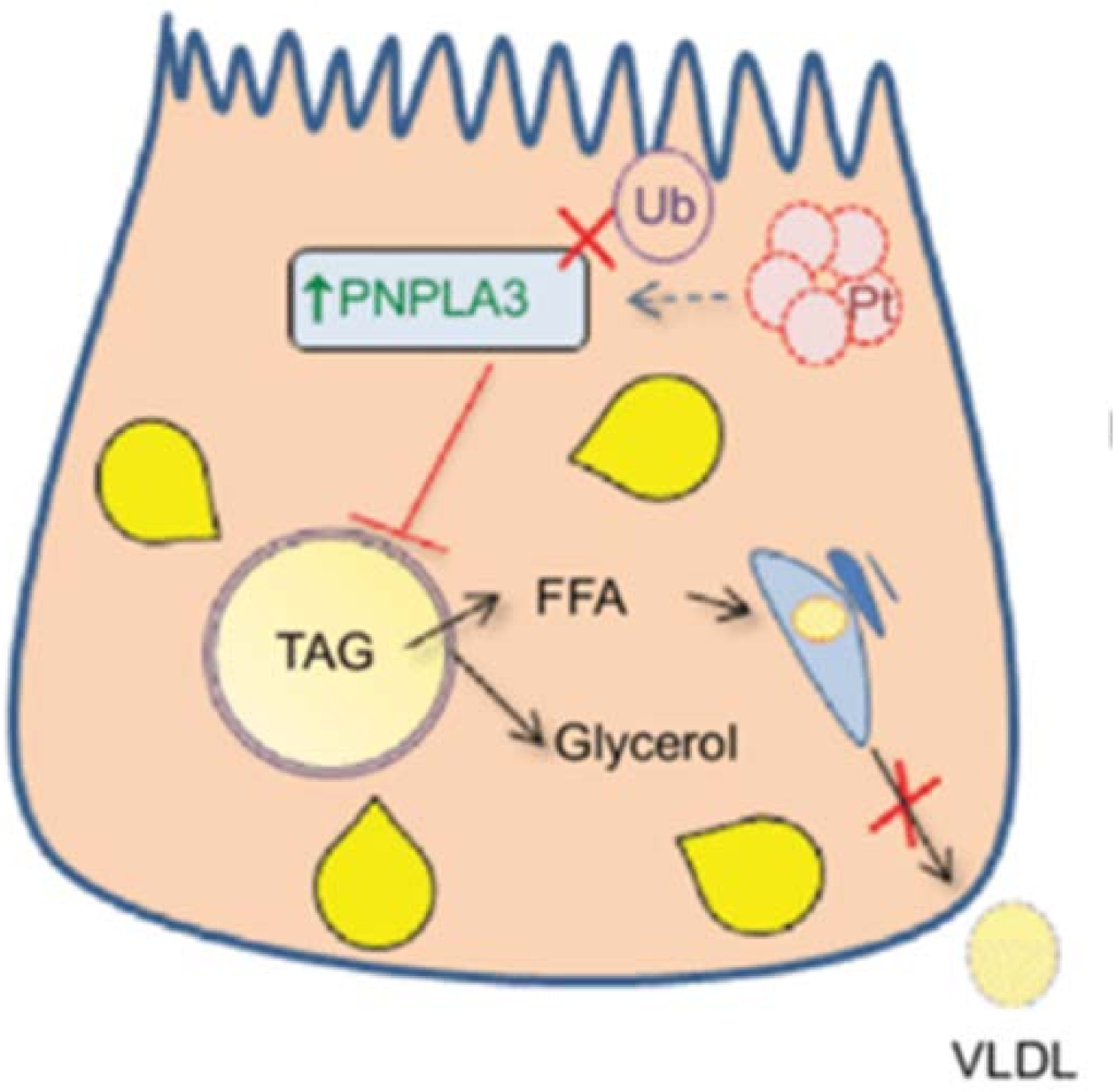
80-85% PCOS
NAFLD

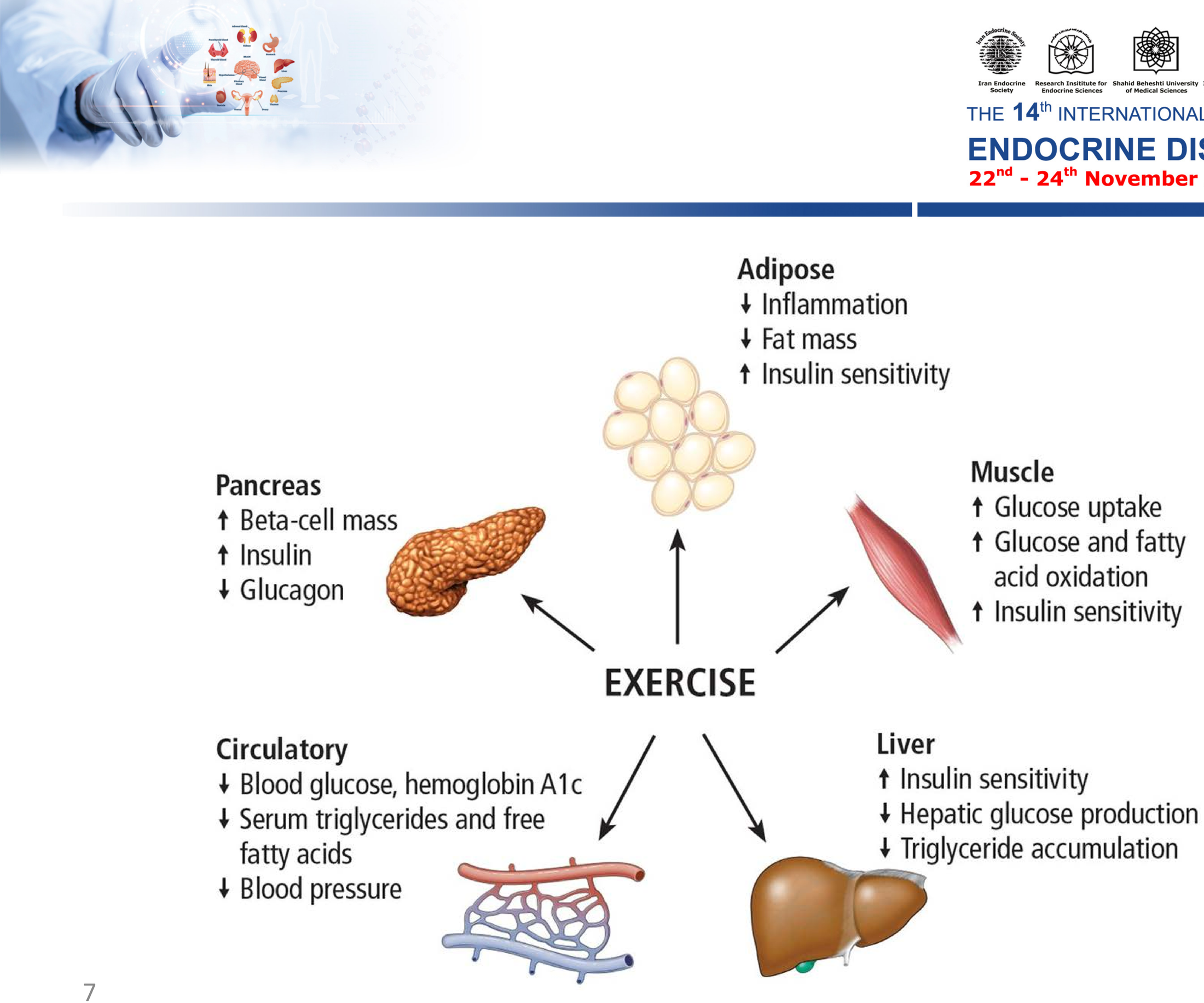
FGF-21 is the 21st member of the FGF protein family and has multiple biological roles.

Increases in T2D, PCOS, CVD, obesity and metabolic syndrome.

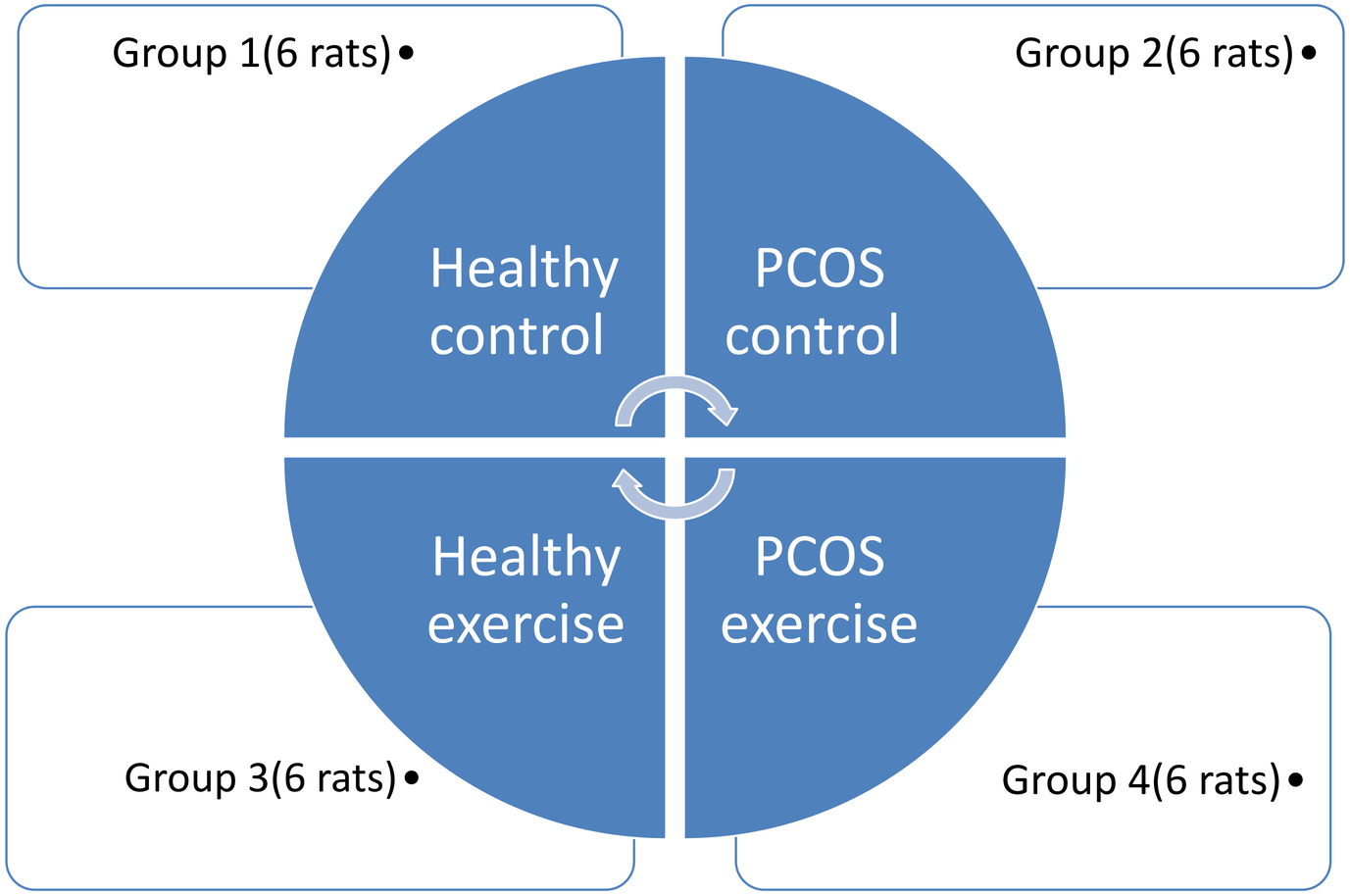


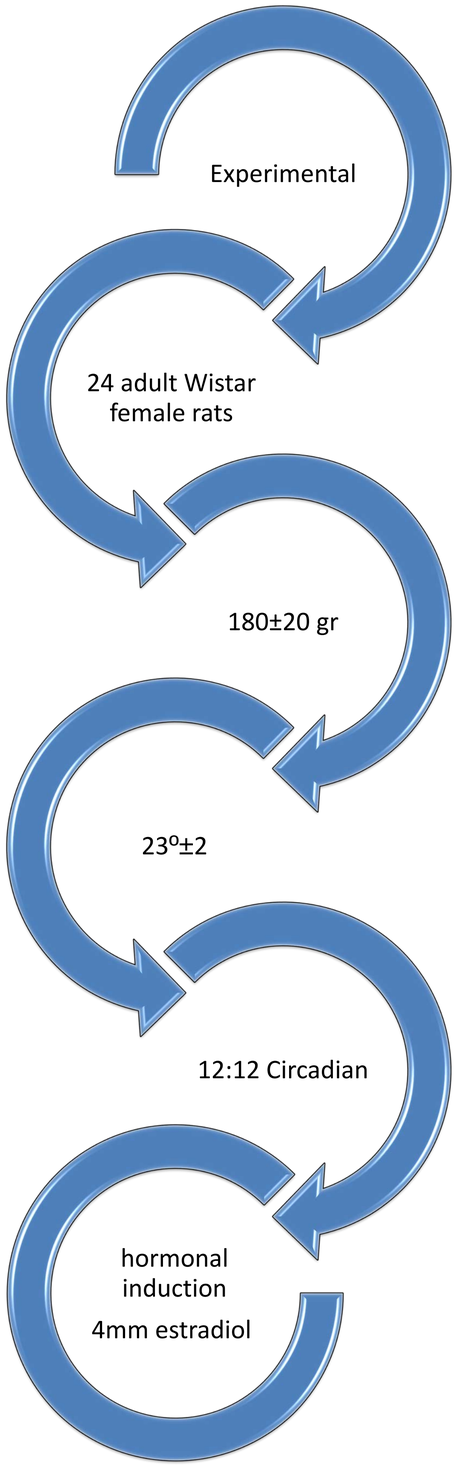
Patatin-like phospholipase domain-containing-3 (PNPLA-3) gene, that also called adiponotrin, is the main determinant of inter-individual and ethnicity-related differences in liver fat content and plays a major role in the occurrence of NAFLD.

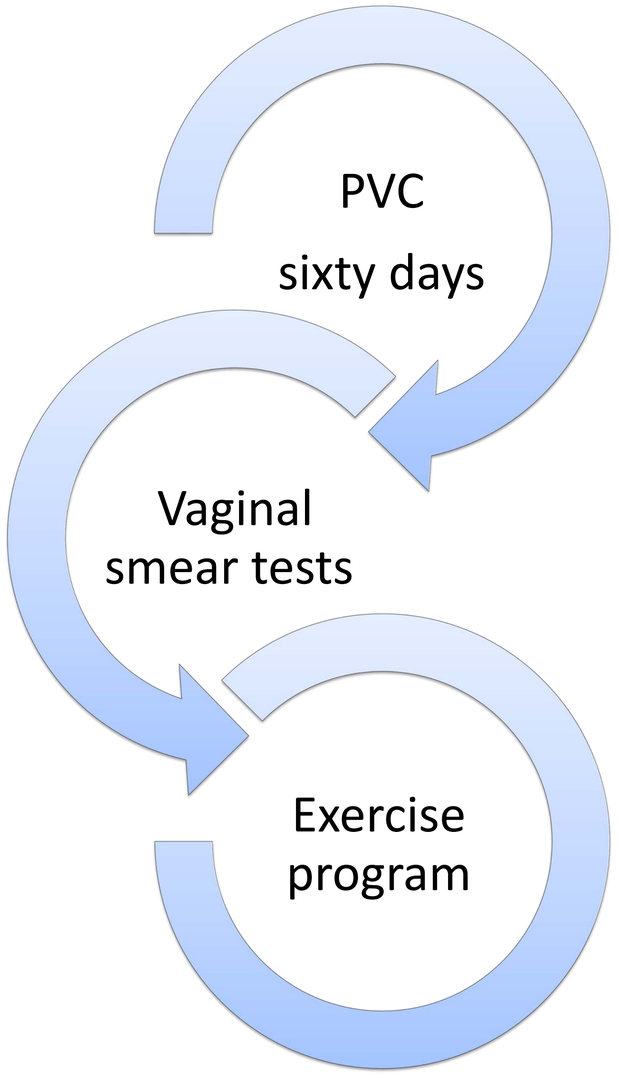


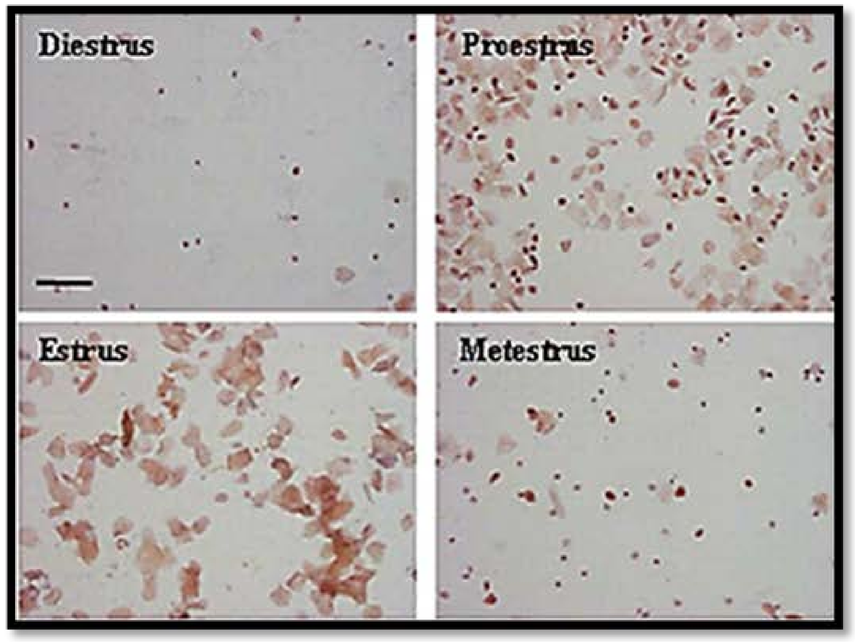

Adipose
↓ Inflammation
↓ Fat mass
↑ Insulin sensitivity
Pancreas
↑ Beta-cell mass
↑ Insulin
↓ Glucagon
Muscle
↑ Glucose uptake
↑ Glucose and fatty acid oxidation
↑ Insulin sensitivity
EXERCISE
Circulatory
↓ Blood glucose, hemoglobin A1c
↓ Serum triglycerides and free fatty acids
↓ Blood pressure
Liver
↑ Insulin sensitivity
↓ Hepatic glucose production
↓ Triglyceride accumulation

methods


Group 1(6 rats)•
Group 2(6 rats)•
Healthy control
PCOS control
Healthy exercise
PCOS exercise
Group 3(6 rats)•
Group 4(6 rats)•


Experimental
24 adult Wistar female rats
180±20 gr
23°±2
12:12 Circadian
hormonal induction
4mm estradiol


PVC
sixty days
Vaginal smear tests
Exercise program


Diestrus
Proestrus
Estrus
Metestrus

Swimming Training Program in 6Weeks

	First Week	Second Week	Third_6th Week
Days	Time (min) -7L/M	Time (min) -7L/M	Time (min) -15L/M
First	10	35	60
Second	15	40	60
Third	20	45	60
4th	25	50	60
5th	30	55	60

Fiberglass water tank:

110 cm length, 35 cm height, 50 cm width.

The capacity was 200 liters

The body material was made of polyethylene.

48 hours after the last training session

- after 12 to 14 hours of fasting

Cut the liver tissue

- RNA extraction

Real Time PCR method

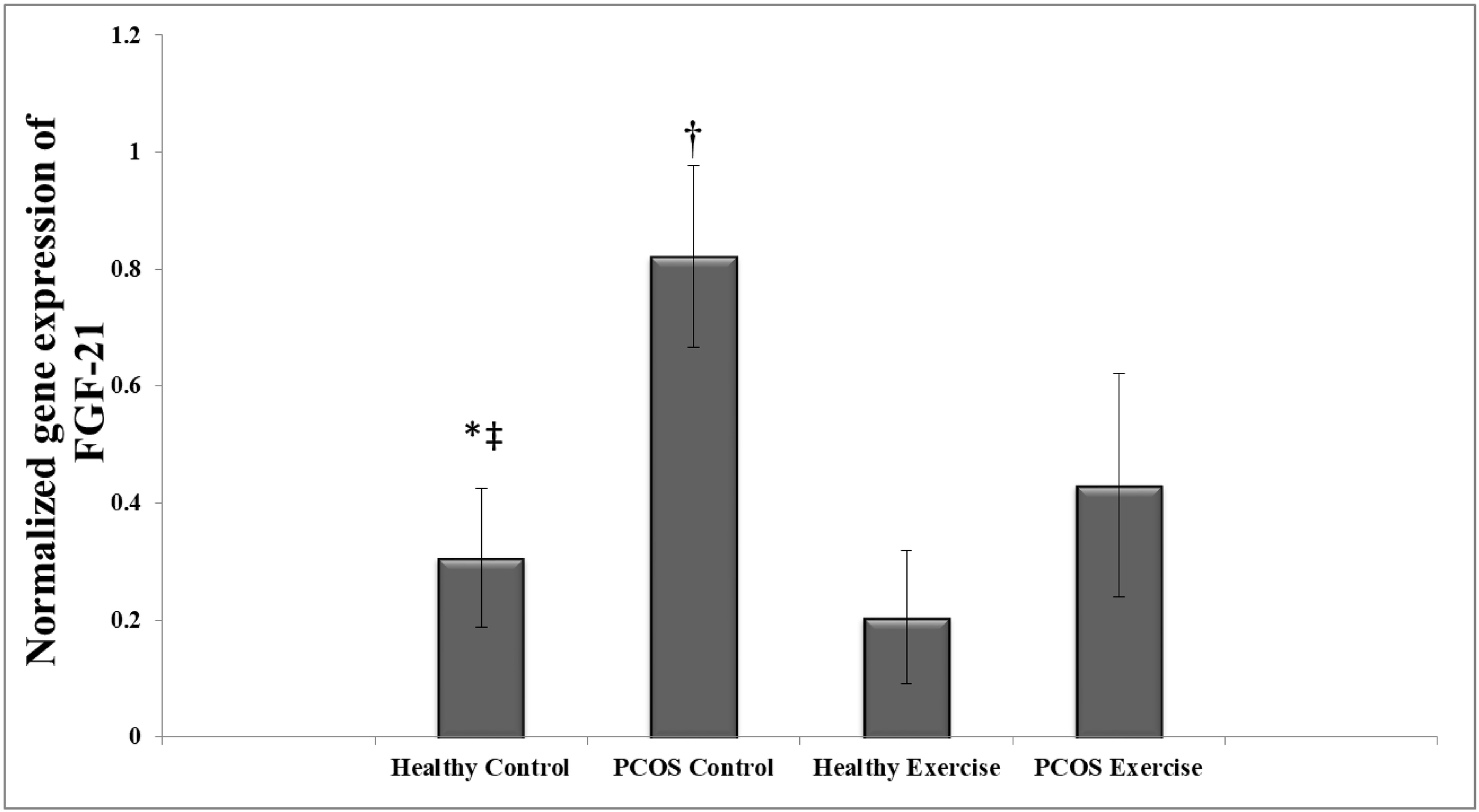
- CtΔΔ calculation

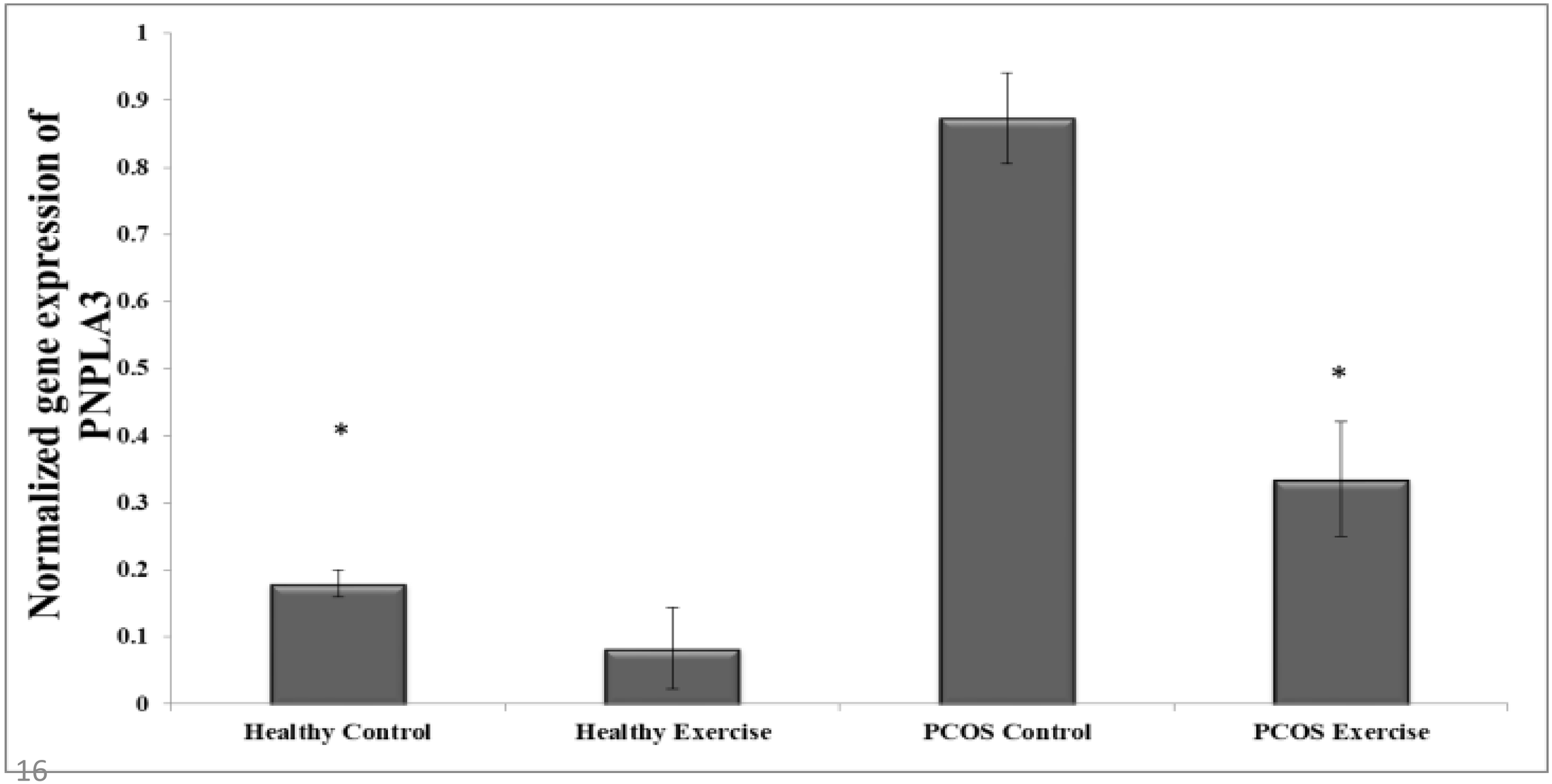
	Accession number	Product size (bp)	Reverse	forward
PNPLA-3	NM_001282324.1	159	GCATCCACCACTTCGTCTTTG	CAACATTAACAAGTGCGTCAGAG
FGF-21	NM_130752.1	128	GGTGTCCTGGTCGTCATCTG	GTCTCCTGCTGCCTGTCTTC

Table_ One_Way ANOVA results

		Sum of Squares	df	Mean Square	F	Sig.
PNPLA3	Between Groups	1.901	3	.634	30.419	.000
	Within Groups	.417	20	.021		
	Total	2.318	23			
FGF_21	Between Groups	1.166	3	.389	22.709	.000
	Within Groups	.342	20	.017		
	Total	1.508	23			

six weeks of swimming training significantly decreased FGF-21 and PNPLA-3 genes in both control and PCOS groups.


Normalized gene expression of FGF-21
1.2
1
0.8
0.6
0.4
0.2
0
*‡
†
Healthy Control
PCOS Control
Healthy Exercise
PCOS Exercise


Normalized gene expression of PNPLA3
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
*
*
Healthy Control
Healthy Exercise
PCOS Control
PCOS Exercise

Title	Result	Name/ Year
Serum FGF21 is markedly decreased in response to aerobic exercise training, offering a novel mechanism to explain the observed reduction in liver fat and improvement in serum biomarkers of liver fibrosis in patients with NASH who do exercise.	patients with NASH exhibit a significant reduction in serum FGF21 following aerobic exercise training .	G. Stine 2023 doi.org/10.3390/nu15061481
Exercise and dietary intervention ameliorate high-fat diet-induced NAFLD and liver aging by inducing lipophagy.	Aerobic exercise may inhibit atherogenesis by regulating FGF21 and NLRP3 inflammasome-mediated pyroptosis.	Gao Y 2020 doi: 10.1016/j.redox.2020.101635

Title	Result	Name/ Year
The exercise training reduced plasma glucose and serum FGF21 levels during glucose loading.	Effect of Aerobic Exercise Training on Circulating Fibroblast Growth Factor-21 Response to Glucose Challenge in Overweight and Obese Men	Masahiro Matsui 2022 DOI: 10.1055/a-1902-3872
the PNPLA3 GG genotype nullified the effect of lifestyle and emerged as an independent risk factor for weight gain, opening new perspectives in NAFLD patient care.	Interaction between Lifestyle Changes and PNPLA3 Genotype in NAFLD Patients during the COVID-19 Lockdown	Felice Cinque yun hou 2022 doi: 10.3390/nu14030556

Title	Result	Name/ Year
The effect of two concurrent exercise modalities on serum concentrations of FGF21, irisin, follistatin, and myostatin in men with type 2 diabetes mellitus, Archives of Physiology and Biochemistry	12 weeks of concurrent training did not have an influence on FGF-21 of the T2DM patients.	Motahari 2020 DOI: 10.1080/13813455.2020.1829649.

In fact, concurrent training probably sensitises FGF-21 actions without changing the concentrations of FGF-21 in T2DM patients.
In addition, regular endurance exercise also reduces liver fat content and improves FGF-21 resistance and levels of PNPLA3 in liver.

Conclusion

In this study, decreasing in FGF-21 and PNPLA-3 was observed as a result of swimming training.

Although, It seems that six weeks of swimming training have positive effects in PCOS patients by improving the metabolic pathway.
Exercise training is an effective non-drug treatment strategy for PCOS treatment, and could reduce clinical symptoms in the long term.

Diet conditions before exercise is gravely relates to FGF-21, which is suggested in future studies.

Also with the morphological examination of the liver, a more accurate connection of the molecular cellular cascades was obtained, which is the limitations of this research. So, it is recommended to investigate NAFLD in the liver in future research.


THANKS
FOR YOUR
ATTENTION