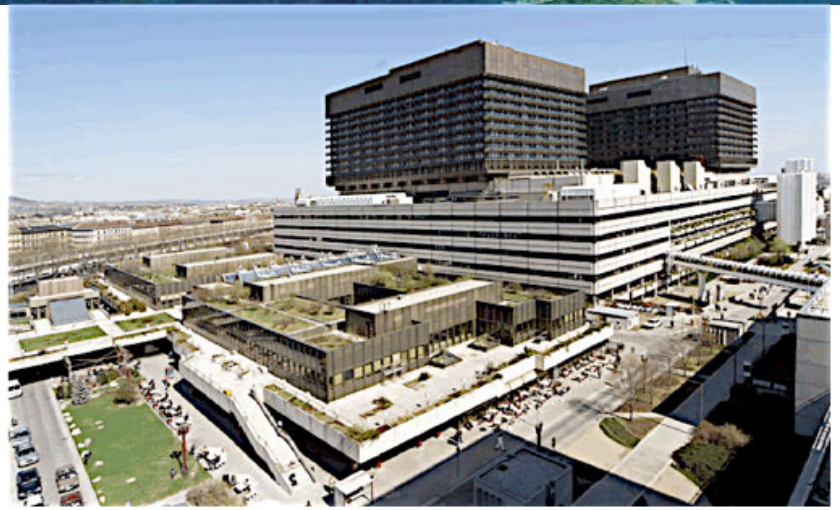
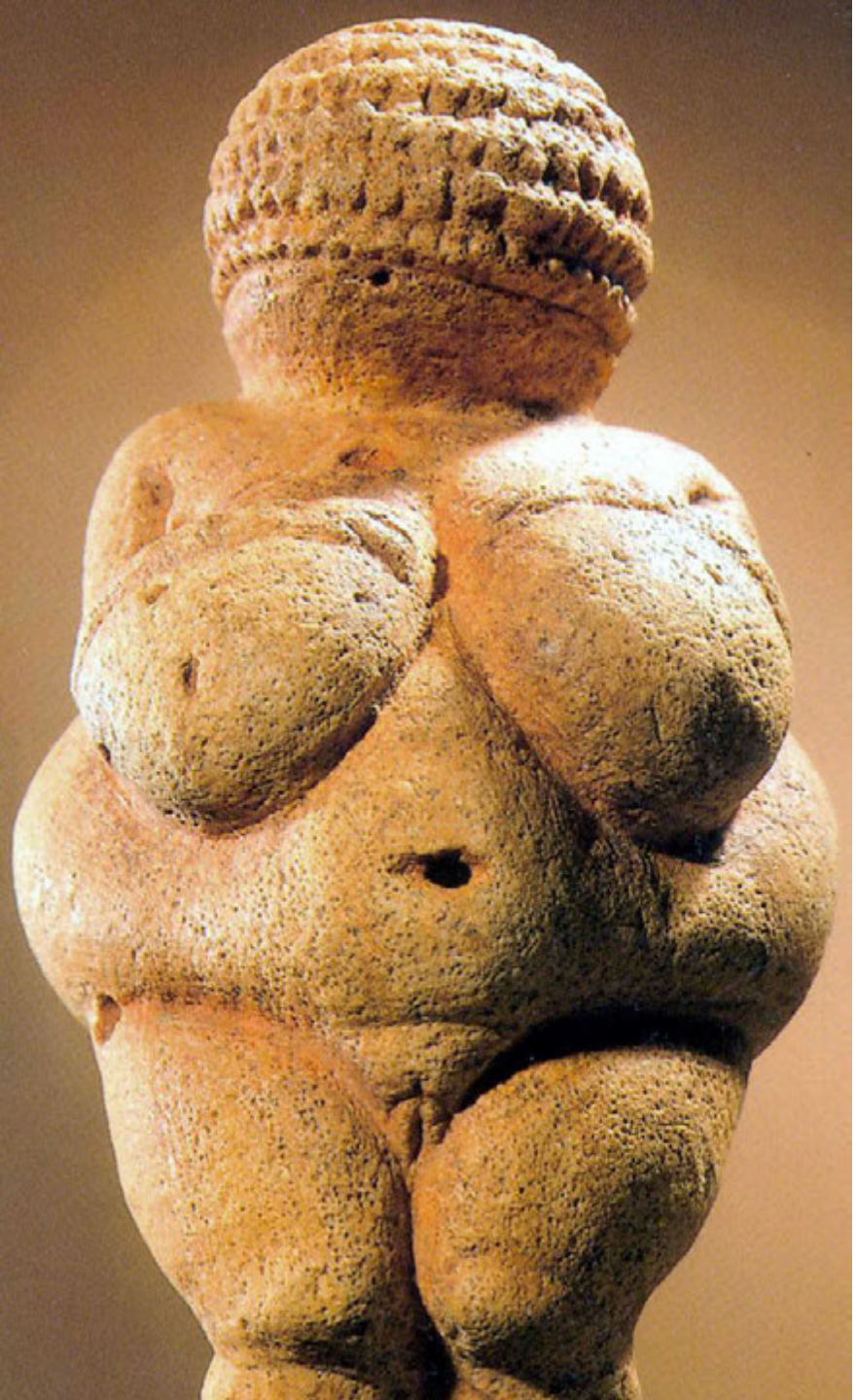
Johannes Huber: The reason of mother Nature to tolerate PCOS Vienna





Forty weeks of pregnancy and three months of breast-feeding require an additional 140,000 kcalories – the female body has to equip itself for the task

trudnoća zahtijeva 140 000 kcal dodatno

BMC Evolutionary Biology

BioMed Central

Hypothesis

Open Access

Evolutionary origins of insulin resistance: a behavioral switch hypothesis

Milind G Watve*[1,2] and Chittaranjan S Yajnik[3]

Address: [1]Anujeeva Biosciences Pvt. Ltd., 10, Pranav Soc. 1000/6-c Navi peth, Pune 411030, India, [2]Department of Microbiology, Abasaheb Garware College, Pune 411004, India and [3]Director, Kamalnayan Bajaj Diabetology Research Centre, King Edward Memorial Hospital, Pune 411011, India

During late pregnancy, mothers develop severe insulin resistance reducing their glucose disposal by up to 50% (Catalano, 1999; Freemark, 2006). This maternal insulin resistance is necessary to ensure an appropriate supply of nutrients to the fetus. The rise of maternal hormones in humans coincides with the development of maternal insulin resistance. In humans, prolactin, progesterone and oestrogens increase during pregnancy. At the beginning

and does so with the aid of so-called physiological insulin resistance

otpornost na inzulin tijekom trudnoće ima smis

Journal of Anatomy

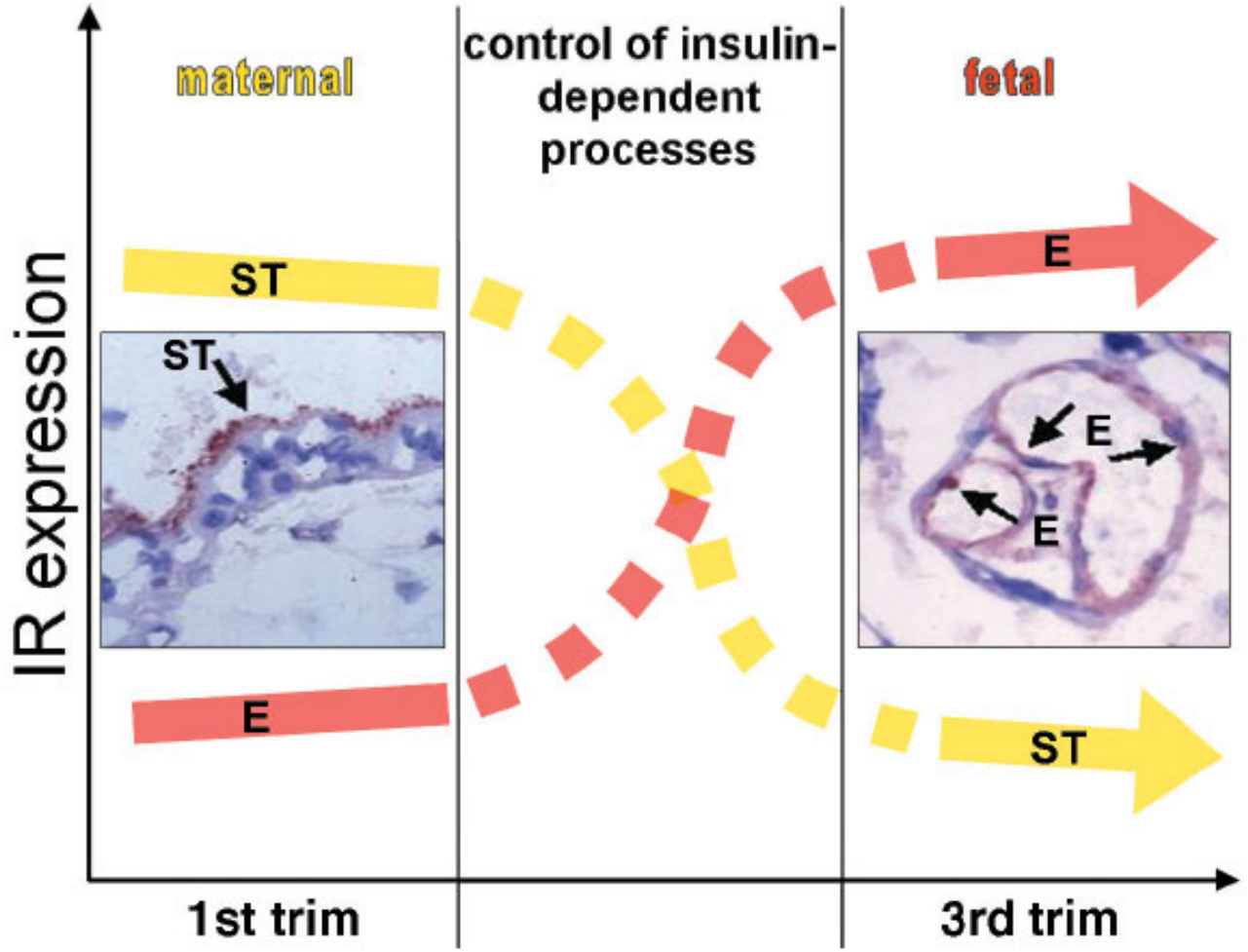
J. Anat. (2009) **215**, pp60–68 doi: 10.1111/j.1469-7580.2008.01035.x

REVIEW

Insulin and the IGF system in the human placenta of normal and diabetic pregnancies

Ursula Hiden,[1] Elisabeth Glitzner,[1] Michaele Hartmann[2] and Gernot Desoye[1]

[1]*Department of Obstetrics and Gynecology, Medical University of Graz, Austria*
[2]*Institute of Cell Biology, Histology and Embryology, Medical University of Graz, Austria*



The expression of the insulin receptor in maternal tissues declines during pregnancy while insulin resistance increases; the opposite occurs in placenta

ORIGINAL ARTICLE

Endocrine Research

Longitudinal Study of Insulin Resistance and Sex Hormones over the Menstrual Cycle: The BioCycle Study

Edwina H. Yeung, Cuilin Zhang, Sunni L. Mumford, Aijun Ye, Maurizio Trevisan, Liwei Chen, Richard W. Browne, Jean Wactawski-Wende, and Enrique F. Schisterman

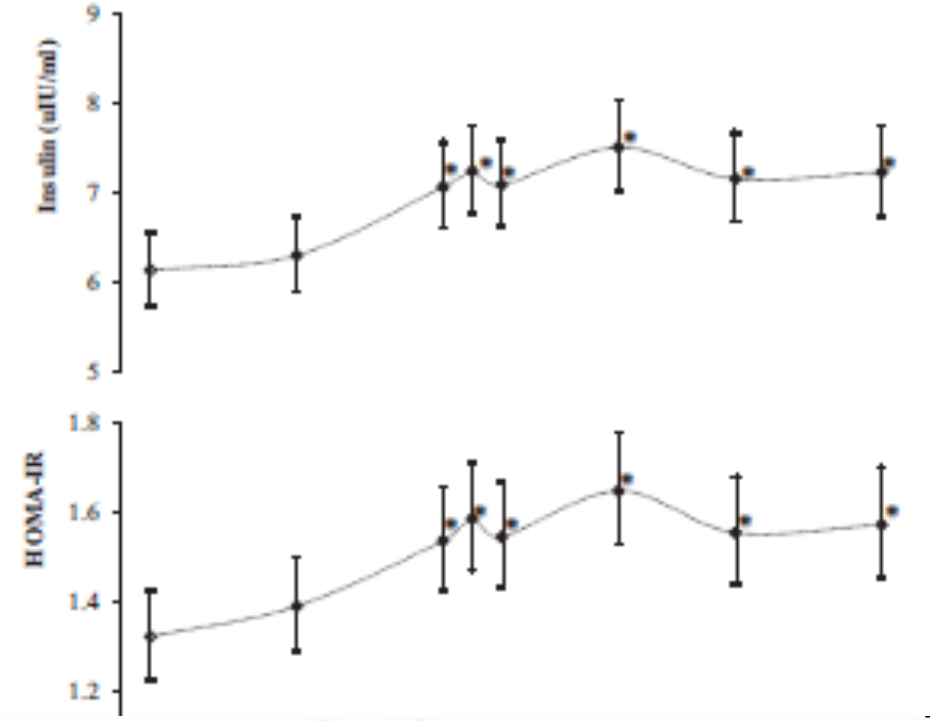
Epidemiology Branch (E.H.Y., C.Z., S.L.M., A.Y., E.F.S.), Division of Epidemiology, Statistics, and Prevention Research, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, Bethesda, Maryland 20892; University of Nevada Health Sciences System (M.T.), Las Vegas, Nevada 89103; Epidemiology Program (L.C.), School of Public Health, Louisiana State University Health Science Center, New Orleans, Louisiana 70112; and Department of Biotechnical and Clinical Laboratory Sciences (R.W.B.), and Department of Social and Preventive Medicine (R.W.B., J.W.-W.), University at Buffalo, Buffalo, New York 14214

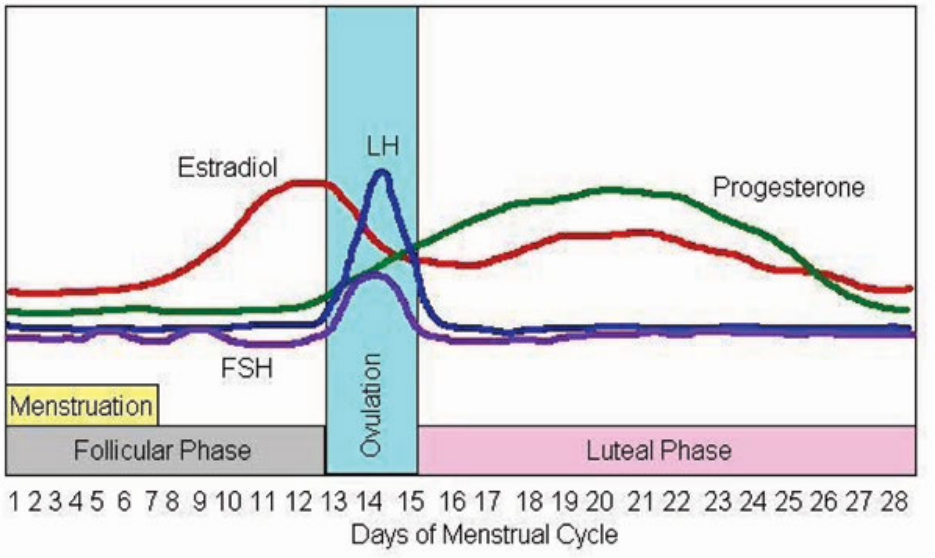
. (*J Clin Endocrinol Metab* 95: 5435–5442, 2010)

This study shows that progesterone is the substance which produces physiological insulin resistance during pregnancy

Progesteron povećava otpornost na inzuli

J Clin Endocrinol Metab, December 2010, 95(12):5435–5442





Reduced insulin sensitivity has been correlated with changes in immune status in pregnancy, including elevated levels of circulating cytokines (e.g., TNF-a and IL-6; Kirwan et al., 2002) that are thought to drive obesity-associated metabolic inflammation (Gregor and Hotamisligil, 2011).

***In contrast to the obese state where they are detrimental to long-term health, loss of insulin sensitivity are beneficial in the context of a normal pregnancy, as they support growth of the fetus* and prepare the body for the energetic demands of lactation.**

(Di Cianni et al., 2003; Lain and Catalano, 2007; Nelson et al., 2010).

We have a similar situation in puberty. During puberty a girl turns into a sexually mature woman within a very short period of time. The female body has to be re-structured for this purpose – also with the aid of insulin resistance which, however, is caused by androgens

Human Reproduction, Vol.24, No.7 pp. 1548–1555, 2009
Advanced Access publication on March 11, 2009 doi:10.1093/humrep/dep049

human reproduction OPINION

Androgen circle of polycystic ovary syndrome

Roy Homburg[1,2,3]

[1]Reproductive Medicine Division, VU University Medical Centre, Amsterdam 1007 MB, The Netherlands [2]Barzilai Medical Centre, Ashkelon, Israel

[3]Correspondence address. E-mail: r.homburg@vumc.nl

Although the aetiology of polycystic ovary syndrome (PCOS) is still not known and the search for causative genes is proving elusive, it is generally agreed that hyperandrogenism is at the heart of the syndrome. Here, it is proposed that excess androgens are the root cause of PCOS starting from their influence on the female fetus in programming gene expression, producing the characteristic signs and symptoms which are then exacerbated by a propagation of excess ovarian androgen production from multiple small follicles, anovulation and insulin resistance in the reproductive life-span, thus setting up a vicious perpetual circle of androgen excess. This opinion paper, rather than being a full-scale review, is intentionally biased in support of this hypothesis that androgen excess is the 'root of all evil' in PCOS; in the hope that its acceptance could lead to more direct treatment of the syndrome in all its facets rather than the symptomatic treatment of side effects of androgen excess that we are addressing today.

Clinical, hormonal and metabolic characteristics of polycystic ovary syndrome among obese and nonobese women in the Croatian population.

Baldani DP, Skrgatić L, Goldstajn MS, Vrcić H, Canić T, Strelec M.

Coll Antropol. 2013 Jun;37(2):465-70

Molecular and Cellular Endocrinology

Volume 373, Issues 1–2, 5 July 2013, Pages 39–50

Polycystic Ovary Syndrome: Models, Manifestations and Management

Review

The Polycystic Ovary Syndrome and recent human evolution

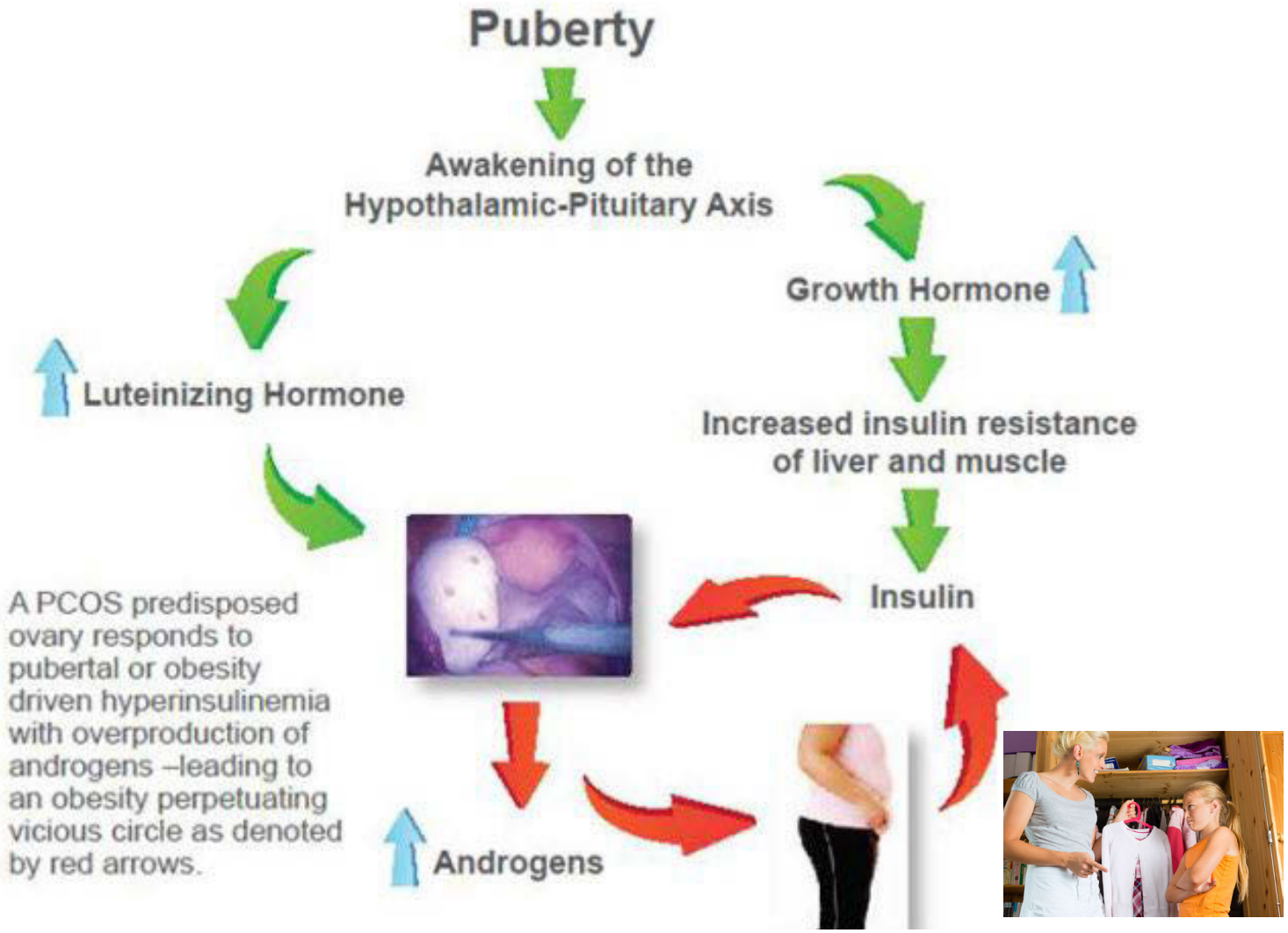
Stephen Corbett[a, b], Laure Morin-Papunen[c, 1]

[a] Population Health, Clinical Support Division (Western), Gungurra (Building 68) Cumberland Hospital, Locked Bag 7118, Parramatta, BC NSW 2124, Australia

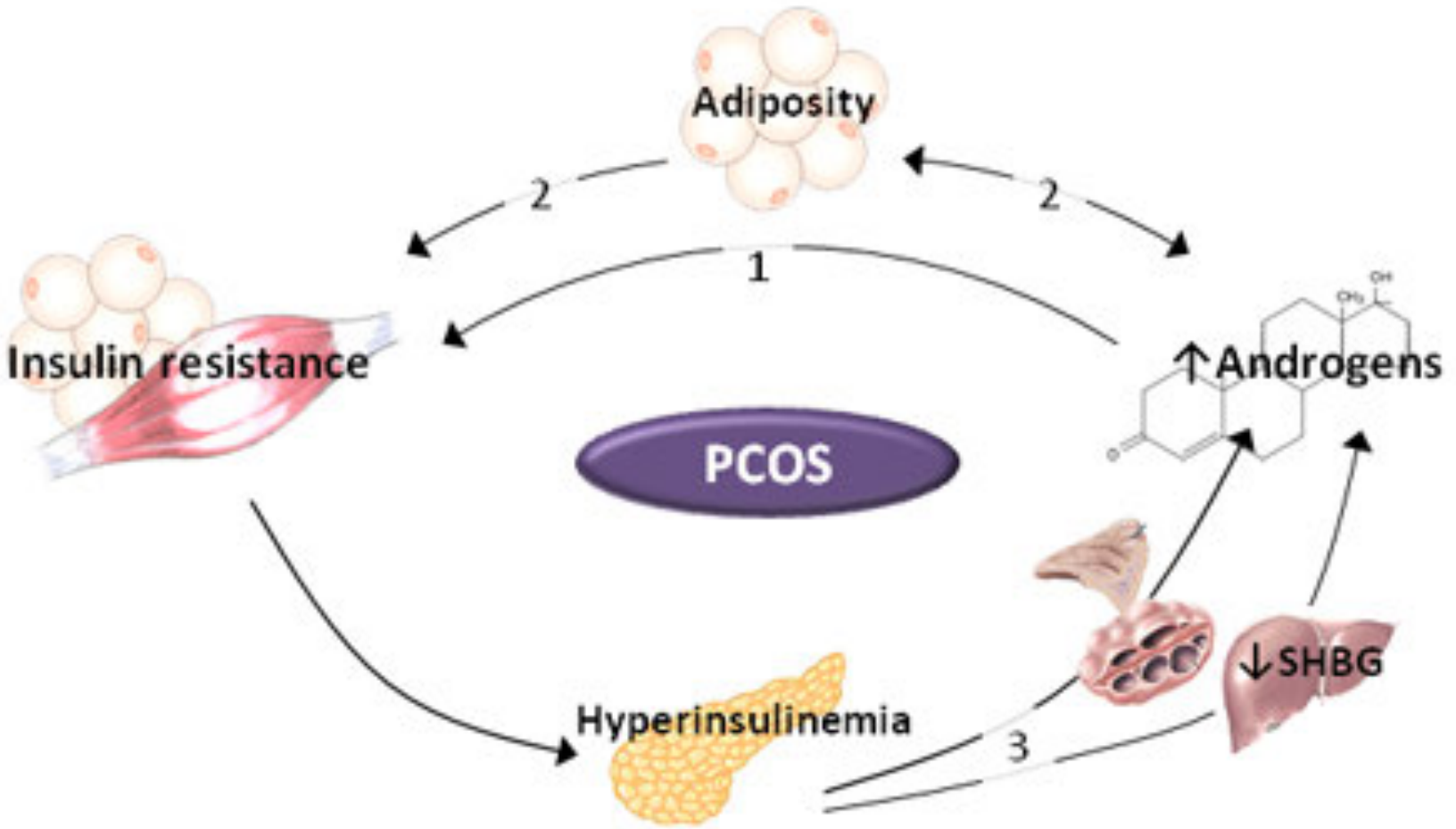
[b] School of Public Health and Western Clinical School, University of Sydney, Australia

[c] Department of Gynecology and Obstetrics, PL 23, FIN 90029 OYS, Oulu, Finland

PCO i otpornost na inzulin tijekom puberteta ima zadatak: ona promijenila djevojčino tijelo za trudnoću



A rise in LH causes hyperandrogenemia. The latter causes insulin resistance and significant weight gain, which is important in puberty.



The key message is that this physiological insulin resistance must occur for a limited period of time. If prolonged over a period of several years, it leads to the established PCOS (polycystic ovary syndrome).

fiziološka PCO ne treba produžiti

Frankfurter Allgemeine
Wissen

Hormonstörung bei Frauen

Unfruchtbarkeit als spätes Erbe

13.04.2013 · Wenn Frauen am Polyzystischen Ovarsyndrom leiden, bleibt ihr Kinderwunsch oft lange unerfüllt. Jetzt deuten Wissenschaftler das Krankheitsbild neu.

Von MARTINA LENZEN-SCHULTE

Artikel | Bilder (1) | Lesermeinungen (8)

© DPA

Als das Überleben des Menschen noch davon abhing, genügend Nahrung zu finden, waren sie die Retterinnen ihrer Sippen - sie konnten auch in schlechten Zeiten und Hungerperioden noch Kinder empfangen und ernähren, wenn ihre Geschlechtsgenossinnen zu geschwächt dafür waren. Heute sind sie diejenigen, die vor allen anderen Frauen unfruchtbar werden und oft nur noch durch künstliche Befruchtung ein Kind empfangen können. Nirgends manifestiert sich klarer ein Wendepunkt der Evolution als an den Frauen, die an einem Polyzystischen Ovarsyndrom (PCOS) leiden. Es handelt sich um die häufigste Hormonstörung der Frau, bis zu fünfzehn Prozent aller Frauen im reproduktionsfähigen Alter weltweit sind betroffen.

PCO nije samo problem - to je također fiziološke funkcije

IMMUNOLOGY

Welcome to the Microgenderome

Magdalena B. Flak, Joana F. Neves, Richard S. Blumberg

The gender bias observed in numerous diseases has long been understood as an entirely host-intrinsic factor. It is one of the many puzzling features of some autoimmune conditions (inappropriate immune responses that attack self antigens and destroy host tissue) including type 1 diabetes mellitus, in which sex hormones affect disease susceptibility and severity (*1*, *2*). On of autoimmune diseases such as type 1 diabetes mellitus, inflammatory bowel disease, multiple sclerosis, and rheumatoid arthritis has been rising, pointing to a role of the environment in these disorders. The so-called "hygiene hypothesis" (*4*) has cast early-life environmental exposures as a determinant of later-life susceptibility to diseases with an immune-mediated etiology (such

Intestinal bacteria and diet are very significant in this phase of life

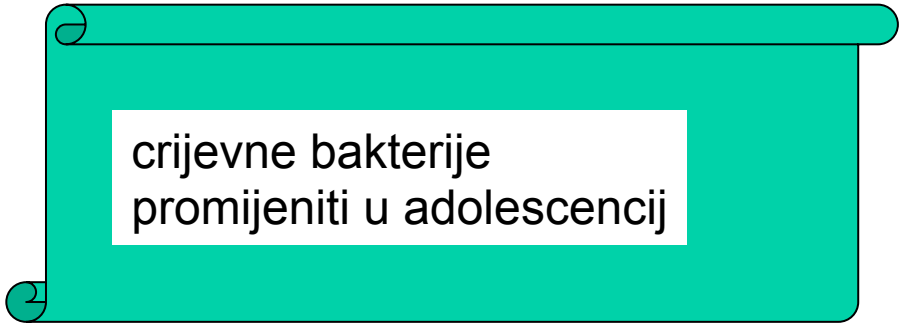
Crijevne bakterije su uključeni u razvoj PCO

The cause of reduced insulin sensitivity in pregnancy remains controversial. In the context of nonpregnant obesity, recent work suggests a role for gut microbiota in reducing insulin sensitivity. (Cani et al., 2007; Vijay-Kumar et al., 2010)

Figure 1 | Home for an abundant microbiological flora. The human gut and (inset) a scanning electron micrograph of part of the small intestine, with some bacterial inhabitants picked out in green.

crijevne bakterije promijeniti u adolescencij

Our results reveal that alteration of the gut microbiome composition in early life potently suppresses autoimmunity in animals at high genetic risk for disease. **Recent human data demonstrate that puberty and pregnancy shape the intestinal microbiota, provoking metabolic changes that may favor fertility and reproduction** . Similar to our findings in the NOD model, sex hormones may also modulate sexual dimorphism in human autoimmune diseases.



Science 1 March 2013

Markle *et al.* show that the pronounced sensitivity of female mice versus resistance of male mice to type 1 diabetes mellitus could be directly attributed to the commensal microbiota.

Specifically, the authors observed that the composition of the commensal microbiota of male and female diverged at the time of puberty, which implies that maleness and femaleness exerted specific influences on the composition of the microbiota.

1 MARCH 2013 VOL 339 **SCIENCE**

dječaci i djevojčice imaju različite crijevne bakterije

Diabetologia (2012) 55:681–688
DOI 10.1007/s00125-011-2410-3

ARTICLE

Age at menarche is associated with prediabetes and diabetes in women (aged 32–81 years) from the general population: the KORA F4 Study

D. Stöckl · A. Döring · A. Peters · B. Thorand · M. Heier · C. Huth · H. Stöckl · W. Rathmann · B. Kowall · C. Meisinger

prerano trudnoće je često povezana s dijabetesom

Results Of the 1,503 women, 226 showed a prediabetic state (impaired fasting glucose and/or impaired glucose tolerance) and 140 persons had diabetes (45 participants with previously undiagnosed diabetes and 95 with known diabetes). In Poisson regression analysis, age at menarche was significantly inversely associated with prediabetes or diabetes after adjustment for year of birth (RR 0.88; 95% CI 0.82, 0.94, $p<0.0001$ per additional year of menarche) and after additional adjustment for a number of confounding factors (RR 0.88; 95% CI 0.83, 0.94, $p=0.0001$). Further adjustment for current BMI slightly attenuated the association with prediabetes or diabetes (RR 0.89; 95% CI 0.83, 0.95, $p=0.0009$), but the association remained clearly significant. *Conclusions/interpretation* Age at menarche seems to be inversely associated with prediabetes and diabetes independent of confounding factors including current BMI. Women at risk for diabetes might be identified by a history of young age at menarche.

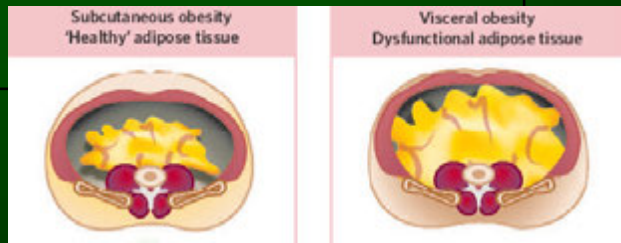
How does one diagnose the condition of long-lasting and unchanging PCOS?

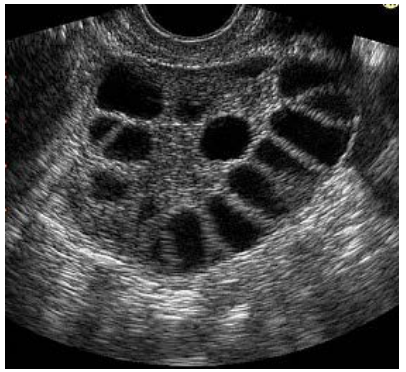
- ADIPONECTIN:

  Frauen: 16,6 ± 5 mg/l

  Männer: 9,8 + 2,9 mg/l

- PROINSULIN: 7 pmol/l





1. PCOS –prevention – treatment : Dietary weight loss

It is important to check an adolescent's weight during the doctor's consultation.

Prevencija i liječenje: smanjiti težinu

ELSEVIER

Journal of Pediatric and Adolescent Gynecology

Available online 7 January 2015

In Press, Corrected Proof — Note to users

Original Study

Effect of Dietary Weight Loss on Menstrual Regularity in Obese Young Adult Women with Polycystic Ovary Syndrome

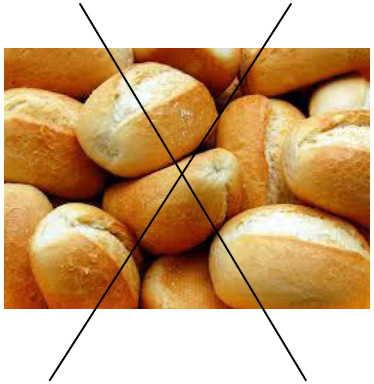
Tayseer M. Marzouk, MD[1], Waleed A. Sayed Ahmed, MD, MRCOG[2],

Conclusion

Dietary weight loss in adolescent women with PCOS resulted in significant improvement in menstrual regularity, BMI, waist circumference, and hirsutism score

2. PCOS: Low Carb nutrition

The girl's diet should be switched to moderately low-carb.



malo ugljikohidrata

Fertil Steril. 2006 March ; 85(3): 679–688. doi:10.1016/j.fertnstert.2005.08.045.

Role of diet in the treatment of polycystic ovary syndrome

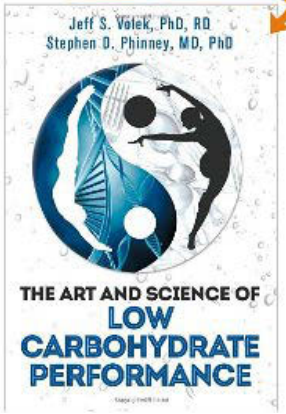
Crystal C. Douglas, Ph.D., R.D.[a,b], **Barbara A. Gower, Ph.D.**[a], **Betty E. Darnell, M.S., R.D.**[b], **Fernando Ovalle, M.D.**[c], **Robert A. Oster, Ph.D.**[b,c], and **Ricardo Azziz, M.D., M.P.H., M.B.A.**[d,e]

[a]Department of Nutrition Sciences, University of Alabama at Birmingham, Birmingham, Alabama

[b]Pittman General Clinical Research Center, University of Alabama at Birmingham, Birmingham, Alabama

Conclusion(s)—A moderate reduction in dietary carbohydrate reduced the fasting and postchallenge insulin concentrations among women with PCOS, which, over time, may improve reproductive/endocrine outcomes.

Click to LOOK INSIDE!



Clinical Endocrinology (2013) 79, 550–557

doi: 10.1111/cen.12175

ORIGINAL ARTICLE

Favourable metabolic effects of a eucaloric lower-carbohydrate diet in women with PCOS

Barbara A. Gower*, Paula C. Chandler-Laney*, Fernando Ovalle†, Laura Lee Goree*, Ricardo Azziz‡, Renee A. Desmond§, Wesley M. Granger¶, Amy M. Goss* and G. Wright Bates**

*Department of Nutrition Sciences, University of Alabama at Birmingham, †Department of Medicine, Division of Diabetes, Endocrinology and Metabolism, University of Alabama at Birmingham, Birmingham, AL, ‡Department of Medicine, Georgia Health Sciences University, Augusta, GA, §Department of Medicine, Division of Preventive Medicine, University of Alabama at Birmingham, ¶Department of Clinical & Diagnostic Sciences, University of Alabama at Birmingham and **Department of Obstetrics and Gynecology, University of Alabama at Birmingham, Birmingham, AL, USA

Summary

Objective Diet-induced reduction in circulating insulin may be

Conclusions In women with PCOS, modest reduction in dietary CHO in the context of a weight-maintaining diet has numerous beneficial effects on the metabolic profile that may lead to a decrease in circulating testosterone.

3. PCOS: dietary fiber

Increase dietary fibers. *vlaknima bogata hrana*

A. Jenkins, David JA, and Alexandra L. Jenkins. "Dietary fiber and the glycemic response." Experimental Biology and Medicine 180.3

Comparable Postprandial Glucose Reductions with Viscous Fiber Blend Enriched Biscuits in Healthy Subjects and Patients with Diabetes Mellitus: Acute Randomized Controlled Clinical Trial

Alexandra L. Jenkins[1], David J.A. Jenkins[1-4], Thomas M.S. Wolever[1-4], Alexander L. Rogovik[1], Elena Jovanovski[1], Velimir Božikov[5], Dario Rahelić[5], Vladimir Vuksan[1-4]

[1]Clinical Nutrition and Risk Factor Modification Center, St. Michael's Hospital and Li Ka Shing Knowledge Institute, Toronto, Ontario, Canada
[2]Department of Nutritional Sciences, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada
[3]Department of Medicine, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada
[4]Division of Endocrinology and Metabolism, St. Michael's Hospital, Toronto, Ontario, Canada
[5]Dubrava University Hospital, Division of Endocrinology, Diabetology, and Metabolic Disorders, School of Medicine, University of Zagreb, Zagreb, Croatia

Aim To compare the blood glucose-lowering effect of a highly viscous fiber blend (VFB) added to a starchy snack on postprandial glycemia between healthy participants and participants with diabetes mellitus.

Methods Ten healthy participants (4 men and 6 women, aged 28 ± 2.6 years, body mass index [BMI], 24.3 ± 0.8 kg/m^2) and 9 participants with diabetes mellitus type 2 (3 men and 6 women, aged 68 ± 3.8 years, BMI 28.8 ± 1.2 kg/m^2) on four separate occasions took either 50 g available carbohydrates as control biscuits, biscuits with 10 g of highly viscous fiber blend, white bread with 12 g of margarine, or white bread alone. Postprandial blood glucose response, glycemic index (GI), and palatability were determined.

Results Mean (95% confidence interval) GI values of the viscous fiber blend biscuits were 26 (16-36) and 37 (27-47) GI units for healthy participants and participants with diabetes mellitus, respectively. These values were significantly lower than those of white bread, white bread

Croat Med J. 2008;49:772-82

Viscous fiber blend significantly reduced the glycemic index by 74% (7.4 GI units/g of fiber) in healthy participants and by 63% (6.3 GI units/g of fiber) in participants with diabetes.

Croat Med J. 2008;49:772-82

4. PCOS: flaxseed *laneno sjeme*

PREVIOUS ARTICLE NEXT ARTICL

Effect of flax seed ingestion on the menstrual cycle.

W R Phipps, M C Martini, J W Lampe, J L Slavin, and M S Kurzer

DOI: http://dx.doi.org/10.1210/jcem.77.5.8077314
First Published Online: July 01, 2013

5. PCOS: Take care for microbioma *rehabilitirati crijevne bakterije*

Medical Hypotheses

Volume 79, Issue 1, July 2012, Pages 104–112

Dysbiosis of Gut Microbiota (DOGMA) – A novel theory for the development of Polycystic Ovarian Syndrome

Kelton Tremellen[a, b], Karma Pearce[b]

Thus, the Dysbiosis of Gut Microbiota (DOGMA) theory of PCOS can account for all three components of the syndrome-anovulation/menstrual irregularity, hyper-androgenism (acne, hirsutism) and the development of multiple small ovarian cysts.

6. PCO Omega – 3 fetty acids *Omega 3 masne kiseline*

Asia Pac J Clin Nutr 2012;21 (4):511-518

Original Article

Effects of omega−3 fatty acids supplementation on serum adiponectin levels and some metabolic risk factors in women with polycystic ovary syndrome

Elahe Mohammadi MSc[1], Maryam Rafraf PhD[2], Laya Farzadi MD[3], Mohammad Asghari-Jafarabadi PhD[4], Siamak Sabour PhD[5]

As a conclusion the present trial showed that supplementation with omega−3 fatty acids had some beneficial effects on serum adiponectin, insulin resistance and lipid profile in PCOS patients. Omega −3 fatty acids may be useful in the control and prevention of metabolic complications of PCOS patients such as type 2 diabetes and cardiovascular diseases.

7. PCO: Inositol

INTERNATIONAL SCHOOL OF GYNECOLOGICAL AND REPRODUCTIVE ENDOCRINOLOGY

THE EDUCATIONAL BRANCH OF ISGE

Ovarian function and reproduction: from needs to possibilities

WINTER SCHOOL 2015

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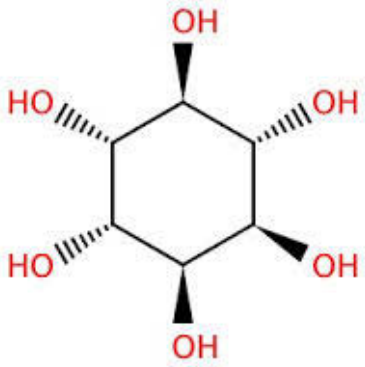
ITALY JAN 28-31 2015



Eur Rev Med Pharmacol Sci. 2003 Nov-Dec;7(6):151-9.

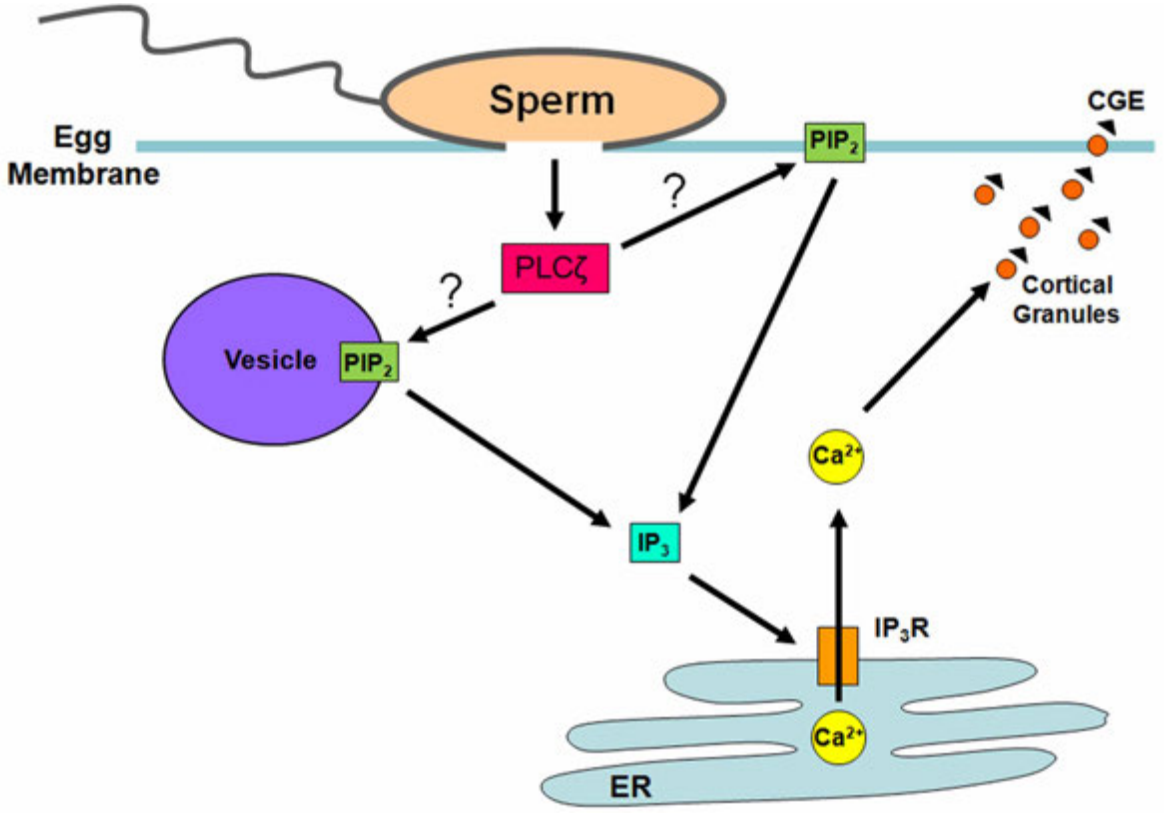
Effects of inositol on ovarian function and metabolic factors in women with PCOS: a randomized double blind placebo-controlled trial.

Gerli S1, Mignosa M, Di Renzo GC.:

Women with oligomenorrhea and polycystic ovaries show a high incidence of ovulation failure perhaps linked to insulin resistance and related metabolic features. A small number of reports shows that inositol improves ovarian function.

METHODS:
Of the 283 patients randomized, 2 withdrew before treatment commenced, 147 received placebo, and 136 received inositol (100 mg, twice a day). The women which discontined the study prematurely were more numerous in the treatment group (n = 45) than the placebo group (n = 15; $P < 0.05$)

CONCLUSIONS:
These data support a beneficial effect of inositol in improving ovarian function in women with oligomenorrhea and polycystic ovaries.



Papaleo, Enrico, et al. "Myo-inositol in patients with polycystic ovary syndrome: a novel method for ovulation induction."Gynecological Endocrinology23.12 (2007): 700-703.

Isabella and Raffone *Journal of Ovarian Research* 2012, **5**:14
http://www.ovarianresearch.com/content/5/1/14

JOURNAL OF OVARIAN RESEARCH

RESEARCH Open Access

Does ovary need D-chiro-inositol?

Rosalbino Isabella[1*] and Emanuela Raffone[2]

Inositol is a polyalcohol classified as insulin sensitizer and existing as nine stereoisomers, two of which are currently used in PCOS treatment: myoinositol (MI) and D-chiro-inositol (DCI) . Both stereoisomers show an insulin-like action in vivo exerting the function of insulin mediators as inositolphosphoglycans (IPGs) . Indeed, MI is the most abundant form of inositol in humans while DCI is synthetized by an insulin-dependent epimerase that converts MI to DCI. Interestingly, every organ has a specific MI/DCI ratio likely linked to its specific needs (i.e. specific biological processes controlled be each inositol).

The D-*chiro*-inositol paradox in the ovary

The D-*chiro*-inositol–to–*myo*-inositol ratio is regulated by an insulin-dependent epimerase. Enzyme activity varies among tissues, likely owing to the specific needs of the two different molecules. We hypothesize that in the ovaries of polycystic ovary syndrome patients, epimerase activity is enhanced, leading to a local *myo*-inositol deficiency which in turn is responsible for the poor oocyte quality. (Fertil Steril® 2011;95:2515–6. ©2011 by American Society for Reproductive Medicine.)

Key Words: Myo-inositol, D-chiro-inositol, PCOS, oocyte quality, FSH

PCOS patients with hyperinsulinemia likely present an enhanced MI to DCI epimerization in the ovary; this would result in an increased DCI/MI ratio (i.e., **overproduction of DCI), which in turn would lead to an MI deficiency in the ovary**. This MI depletion could eventually be responsible for the poor oocyte quality observed in these patients (22).

Furthermore, because MI supplementation reduces the rFSH IU administrated during IVF cycles (17, 18), it is likely that the putative MI deficiency in the ovary would also impair the FSH signaling, resulting in an increased risk of ovarian hyperstimulation syndrome for PCOS patients. Therefore, we could speak of a ‘‘DCI paradox’’: indeed, although DCI is useful in the treatment of PCOS patients to reduce IR, it has no effect at ovarian level.

8. PCOS - Chromium

Proceedings of the Nutrition Society (2008), **67**, 48–53 DOI:10.1017/S0029665108006010
© The Author 2008

The Summer Meeting of the Nutrition Society, hosted by the Irish Section, was held at the University of Ulster, Coleraine on 16–19 July 2007

Plenary Lecture

Chromium and polyphenols from cinnamon improve insulin sensitivity

Richard A. Anderson
Beltsville Human Nutrition Research Center, USDA, Beltsville, MD 20705, USA

The signs of Cr deficiency are similar to those for the metabolic syndrome and supplemental Cr has been shown to improve all these signs in human subjects. **In a double-blind placebo-controlled study it has been demonstrated that glucose, insulin, cholesterol and HbA1c are all improved in patients with type 2 diabetes following Cr supplementation.**

9. PCO: Cinnemon - *cimet*

Cinnamon: Potential Role in the Prevention of Insulin Resistance, Metabolic Syndrome, and Type 2 Diabetes

Bolin Qin, M.D., Ph.D.,[1,2] Kiran S. Panickar,[1] and Richard A. Anderson, Ph.D., C.N.S.[1]

Abstract

Metabolic syndrome is associated with insulin resistance, elevated glucose and lipids, inflammation, decreased antioxidant activity, increased weight gain, and increased glycation of proteins. Cinnamon has been shown to improve all of these variables in *in vitro*, animal, and/or human studies. In addition, cinnamon has been shown to alleviate factors associated with Alzheimer's disease by blocking and reversing tau formation *in vitro* and in ischemic stroke by blocking cell swelling. *In vitro* studies also show that components of cinnamon control angiogenesis associated with the proliferation of cancer cells. Human studies involving control subjects and subjects with metabolic syndrome, type 2 diabetes mellitus, and polycystic ovary syndrome all show beneficial effects of whole cinnamon and/or aqueous extracts of cinnamon on glucose, insulin, insulin sensitivity, lipids, antioxidant status, blood pressure, lean body mass, and gastric emptying. However, not all studies have shown positive effects of cinnamon, and type and amount of cinnamon, as well as the type of subjects and drugs subjects are taking, are likely to affect the response to cinnamon. In summary, components of cinnamon may be important in the alleviation and prevention of the signs and symptoms of metabolic syndrome, type 2 diabetes, and cardiovascular and related diseases.

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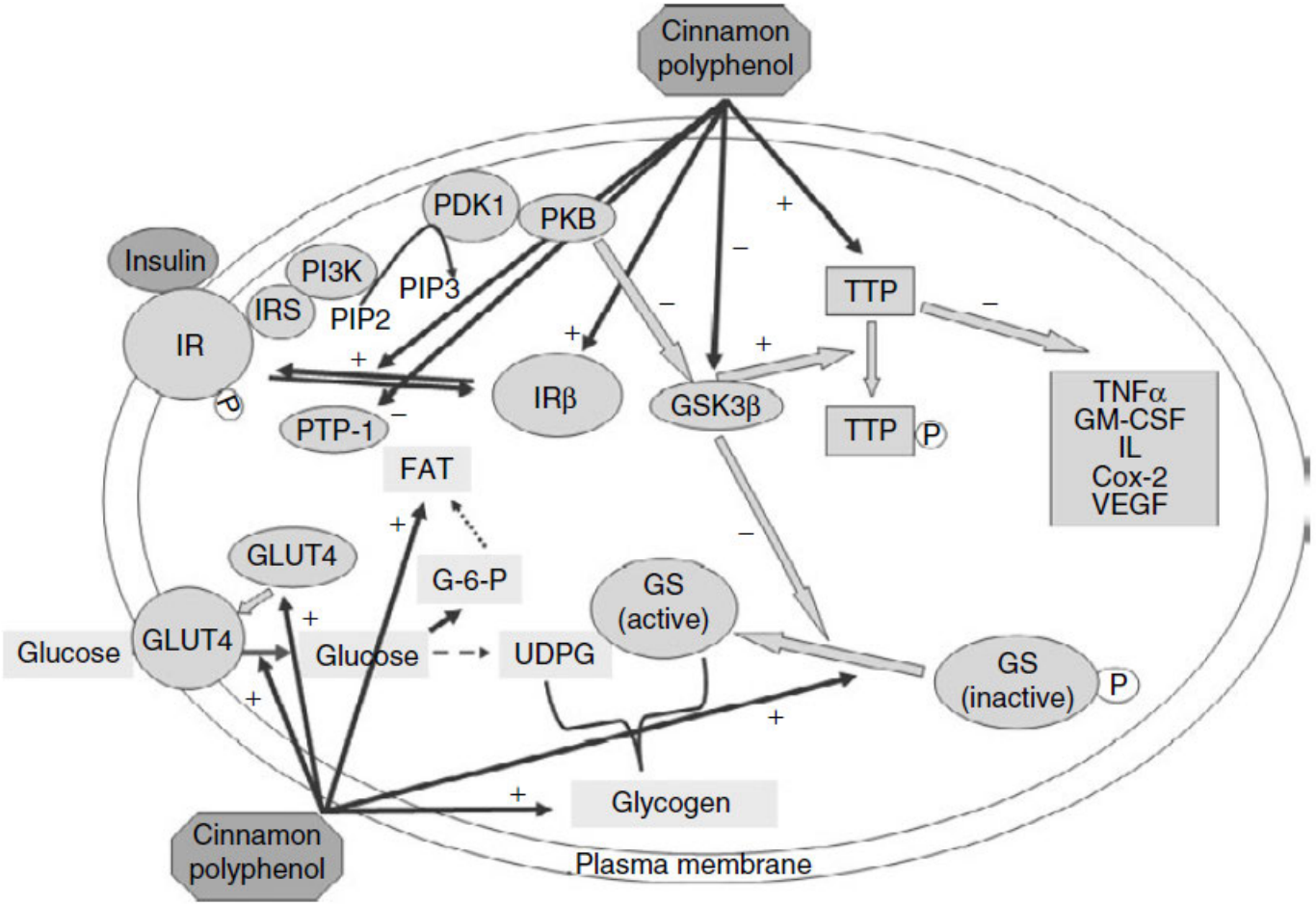

Fig. 3. A model of actions of cinnamon polyphenols (CP) in the insulin signal transduction pathway leading to beneficial effects in subjects with glucose intolerance or type 2 diabetes: (1) CP activate insulin receptors (IR) by increasing their tyrosine phosphorylation activity and by decreasing phosphatase activity that inactivates the receptor; (2) CP increase the amount of insulin receptor-β and GLUT4 proteins; (3) CP increase glycogen synthase activity and glycogen accumulation; (4) CP decrease glycogen synthetase (GS) kinase-3 β (GSK3β) activity; (5) CP increase the amount of tristetraprolin (TTP) protein;

10. PCO: Exercise

otpornost na inzulin je čimbenik razvoja

News Focus

The goal of much of modern medicine and culture is effectively to stop evolution. Is that happening?

Are Humans Still Evolving?

The news made headlines around the world: Blonds were going extinct. According to CNN and other media, a World Health Organization (WHO) study concluded that the gene for blond hair, which was described as recessive to dominant genes for dark hair, would disappear in 200 years. The BBC announced that the last natural blond would be born in Finland and suggested that those who dyed their hair might be to blame, because "bottle blonds" were apparently more attractive to the opposite sex than natural blonds were and thus had more children.

ral selection and other evolutionary mechanisms. Some say the question itself betrays a misunderstanding of how evolution works. "The very notion that … we might not be evolving derives from a belief that all other life forms were merely stages on the way to

In that sense, in the developed world, human evolution has stopped."

Yet millions of people in developing countries continue to live under the combined stresses of poverty and disease. Under these conditions, even skeptics of ongoing human evolution agree that natural selection may be favoring genes that confer resistance to disease or enhance reproductive fitness in other ways. Indeed, researchers are now tracking how deadly maladies such as AIDS and malaria exert selective pressure on people today. "As long as some people die before reproducing or reaching reproductive age, selection is likely to be acting," says geneticist Chris

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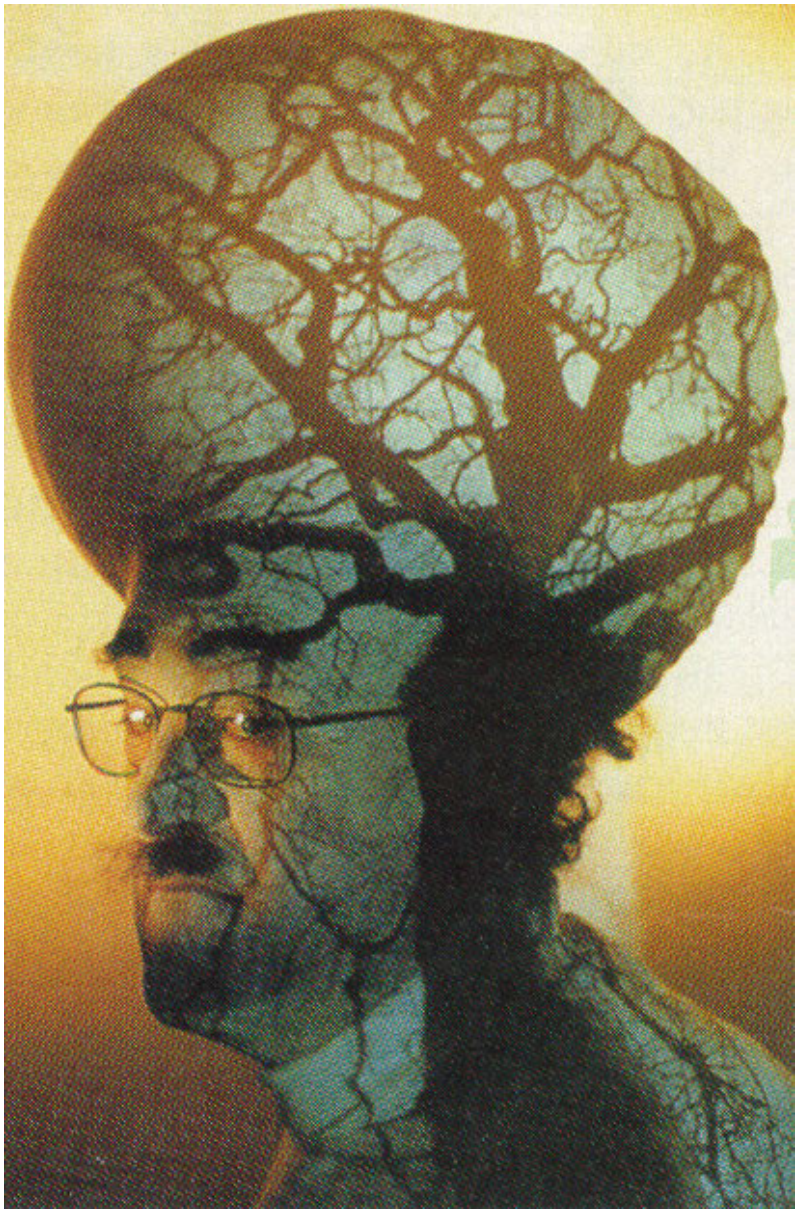

možda je evolucija nastavlja