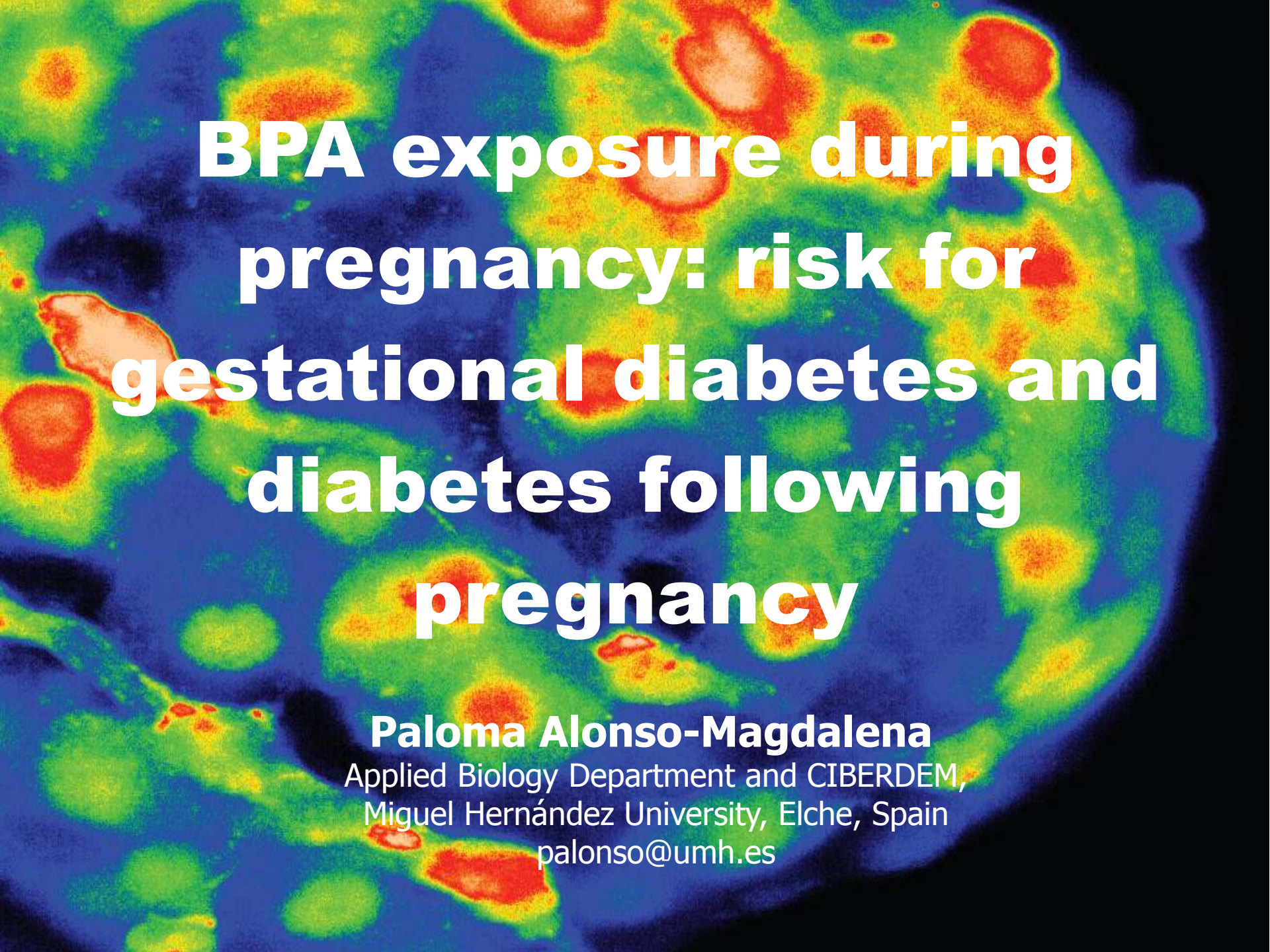

# BPA exposure during pregnancy: risk for gestational diabetes and diabetes following pregnancy

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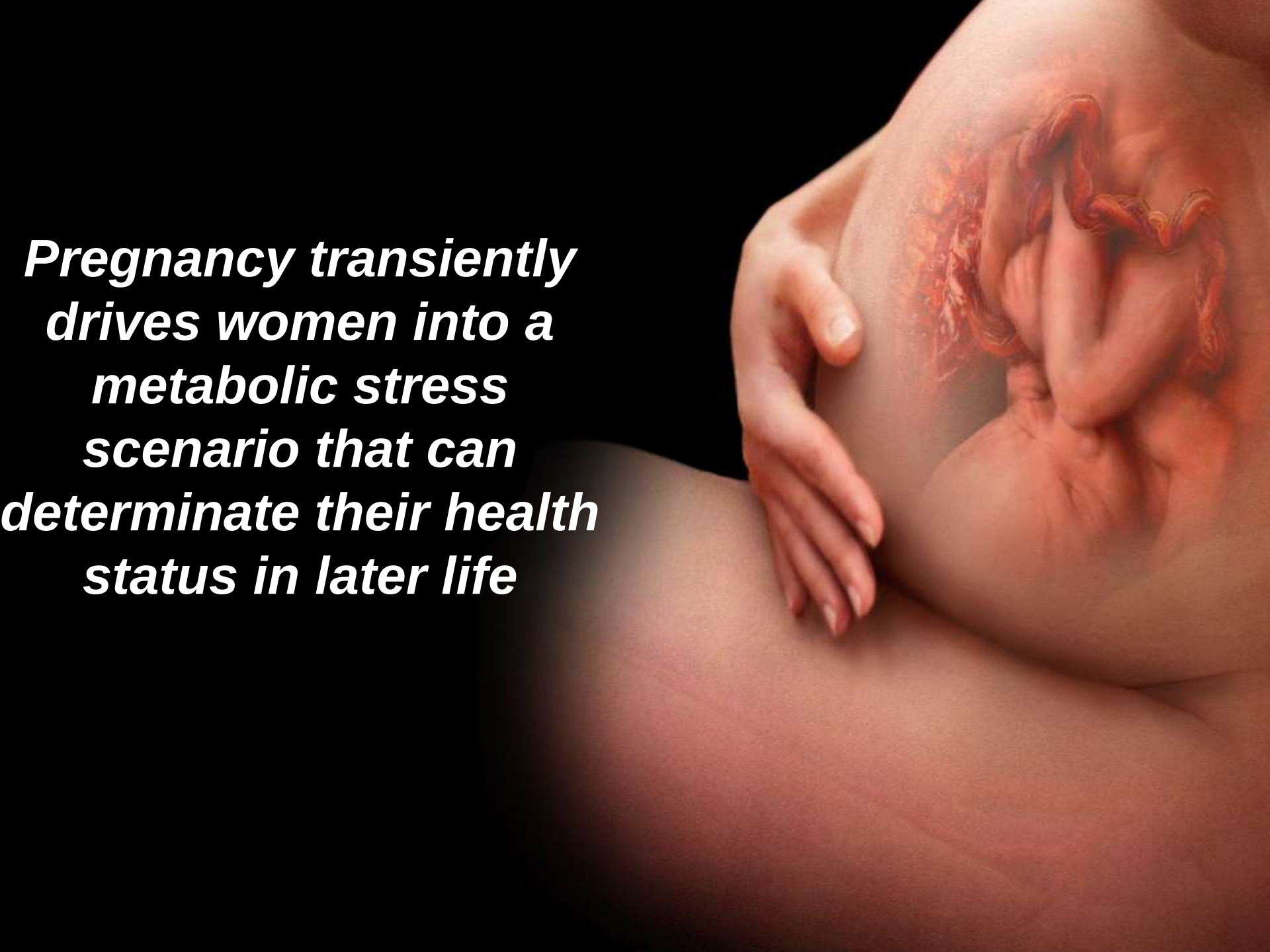
***Pregnancy transiently drives women into a metabolic stress scenario that can determinate their health status in later life***



- Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy

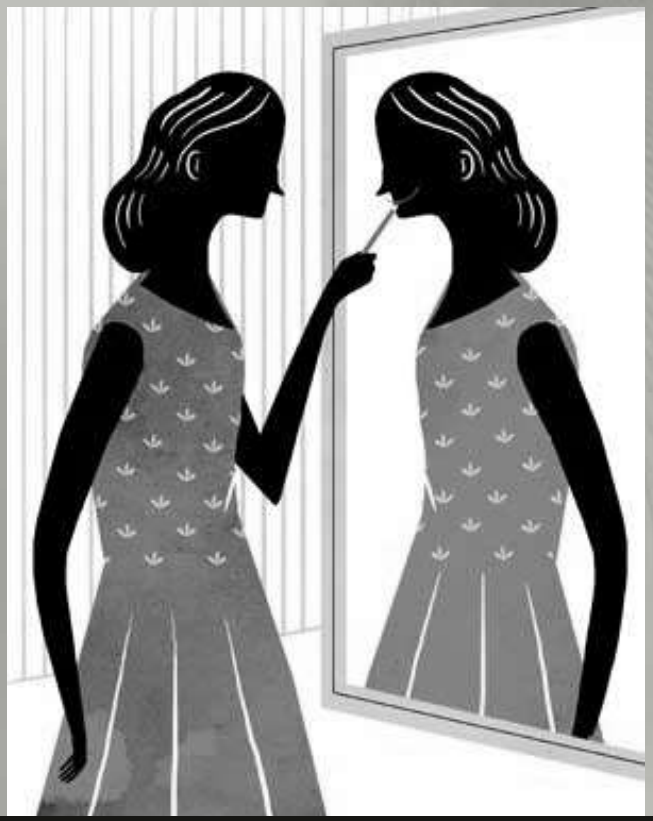
- Aproximately 7% of all pregnancies are complicated by GDM resulting in more than 200,000 cases anually.

# RISKS FACTORS FOR GDM

- ✓ Age
- ✓ History of gestational diabetes
- ✓ Obesity
- ✓ Ethnicity
- ✓ Sedentary lifestyle
- ✓ History of smoking

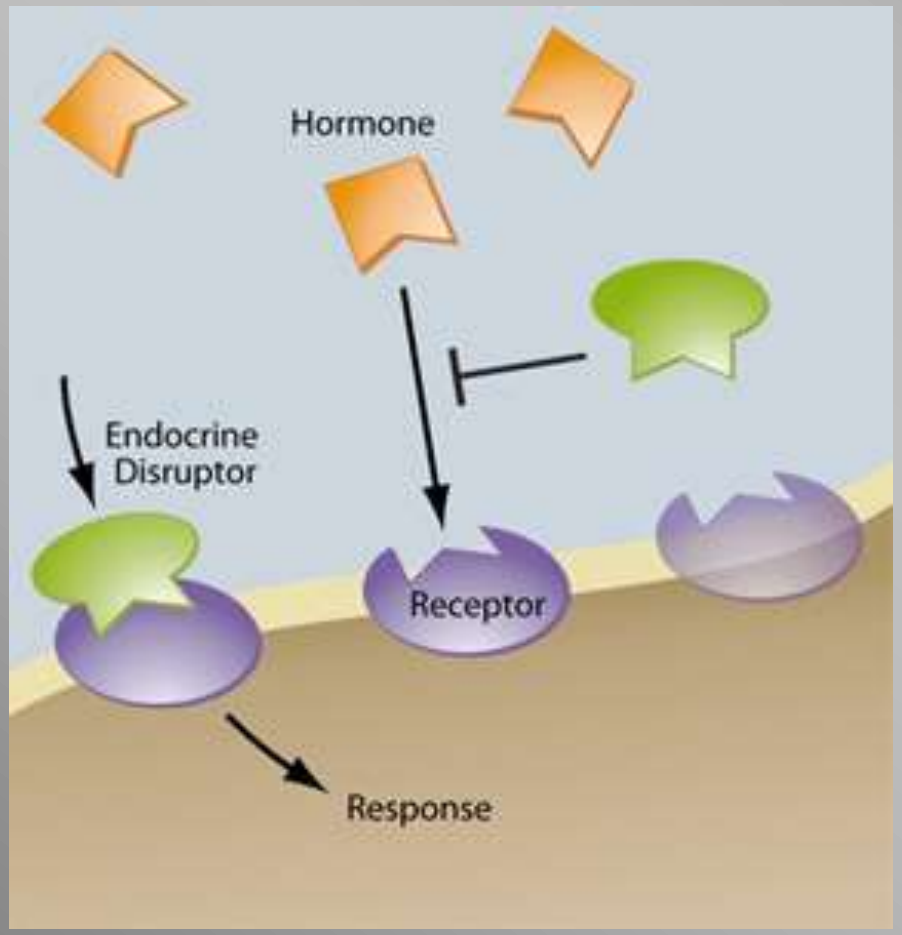
# CONSEQUENCES OF GESTATIONAL DIABETES IN THE LONG TERM.....

# THROUGH THE LOOKING GLASS



- During post-partum most of the women return to euglycemic state, however carbohydrate intolerance can return with age.
- Women with GDM are at increased risk for the development of diabetes, usually type 2, after pregnancy.

**Glucose intolerance during pregnancy as a predictor of maternal long -term health**




"***ENDOCRINE DISRUPTORS*** ***have been defined as exogenous substances that alter function(s) of the endocrine system and consequently cause adverse health effects in an intact organism, its progeny, or subpopulations***"

**The International Program for Chemical Safety**

- WHAT HAPPEN IF MOTHERS ARE EXPOSED TO THESE COMPOUNDS DURING PREGNANCY?

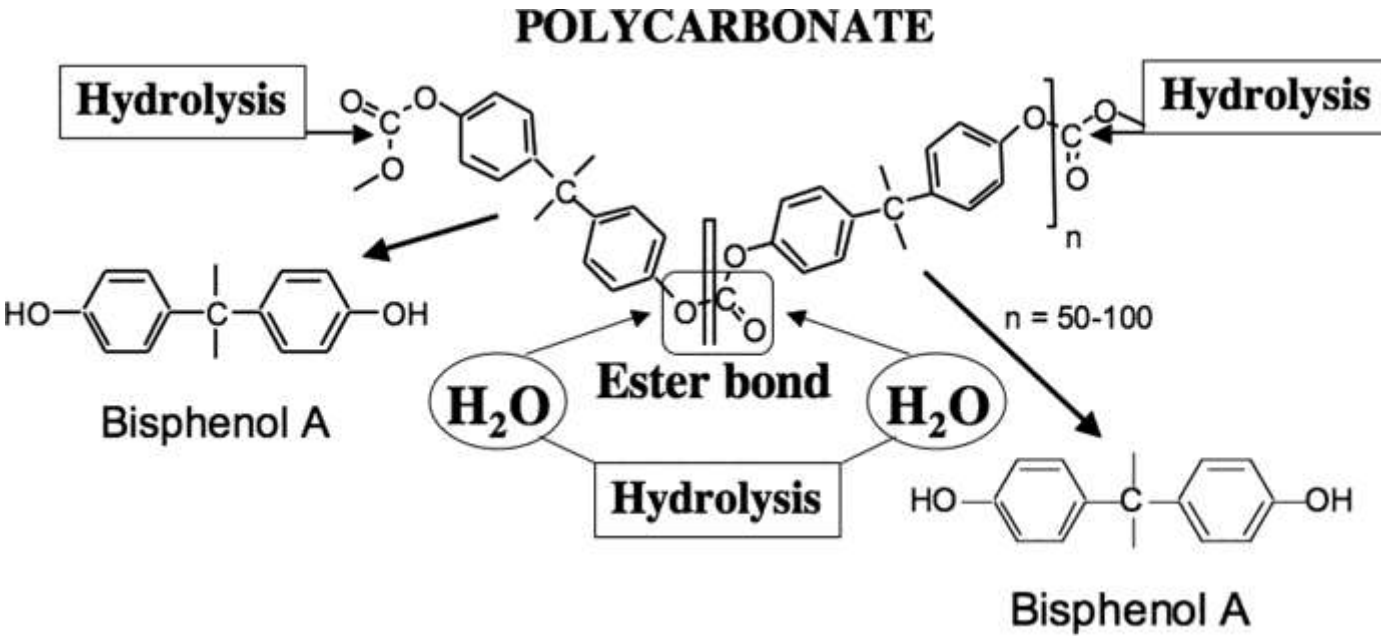
# RISKS FACTORS FOR GDM AND LONG-TERM COMPLICATIONS

- ✓ **Age**
- ✓ **History of gestational diabetes**

## ENDOCRINE DISRUPTOR CHEMICALS

- ✓ **Sedentary lifestyle**
- ✓ **History of smoking**
- ✓ **PCOs**

# The case of bisphenol A: What is and where is found BPA?




Welshons, W. V. et al. Endocrinology 2006

# BISPHENOL-A CONCENTRATION IN HUMAN SAMPLES:

BPA has been detected in 93% of the urine samples in USA (Calafat et al, 2008)

**0.3-4.4 ng/ml (1.3-19.4 nM)** unconjugated BPA in human blood from adult men and women (Vandenberg et al, EHP 2010)

**BPA** levels  detected in amniotic fluid, neonatal blood, placenta, cord blood and human breast milk.

# Bisphenol-A action on pregnant mice

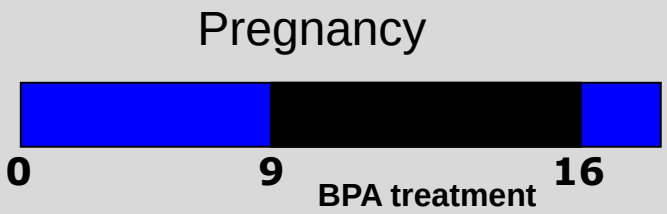

BPA treatment

**End points measured at pregnancy days 17 and 18**

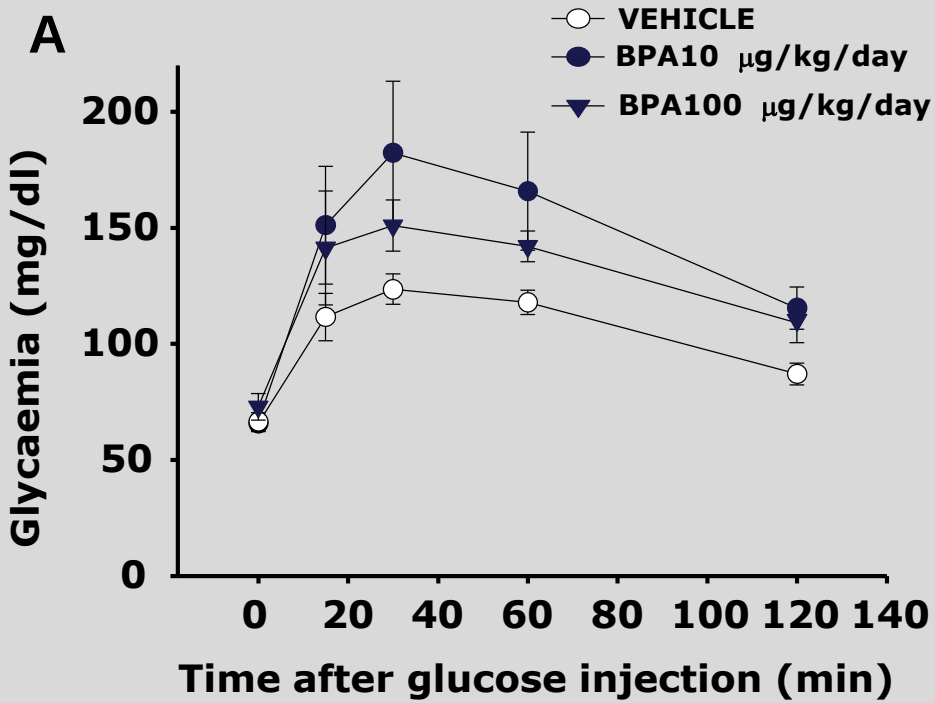
**BPA 10 μg/kg/day**

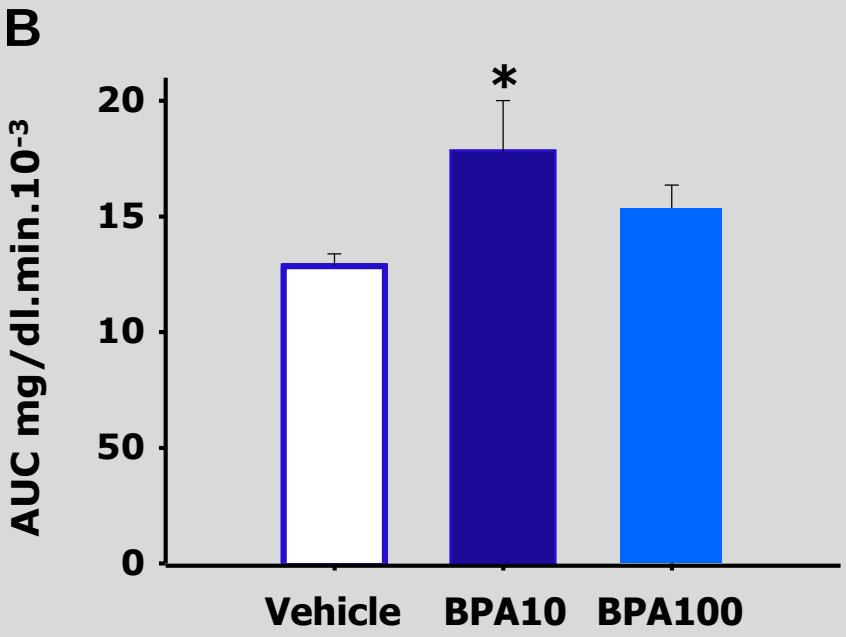
**BPA 100 μg/kg/day**


Alonso-Magdalena et al, EHP 2010




**End points measured at pregnancy days 17 and 18**

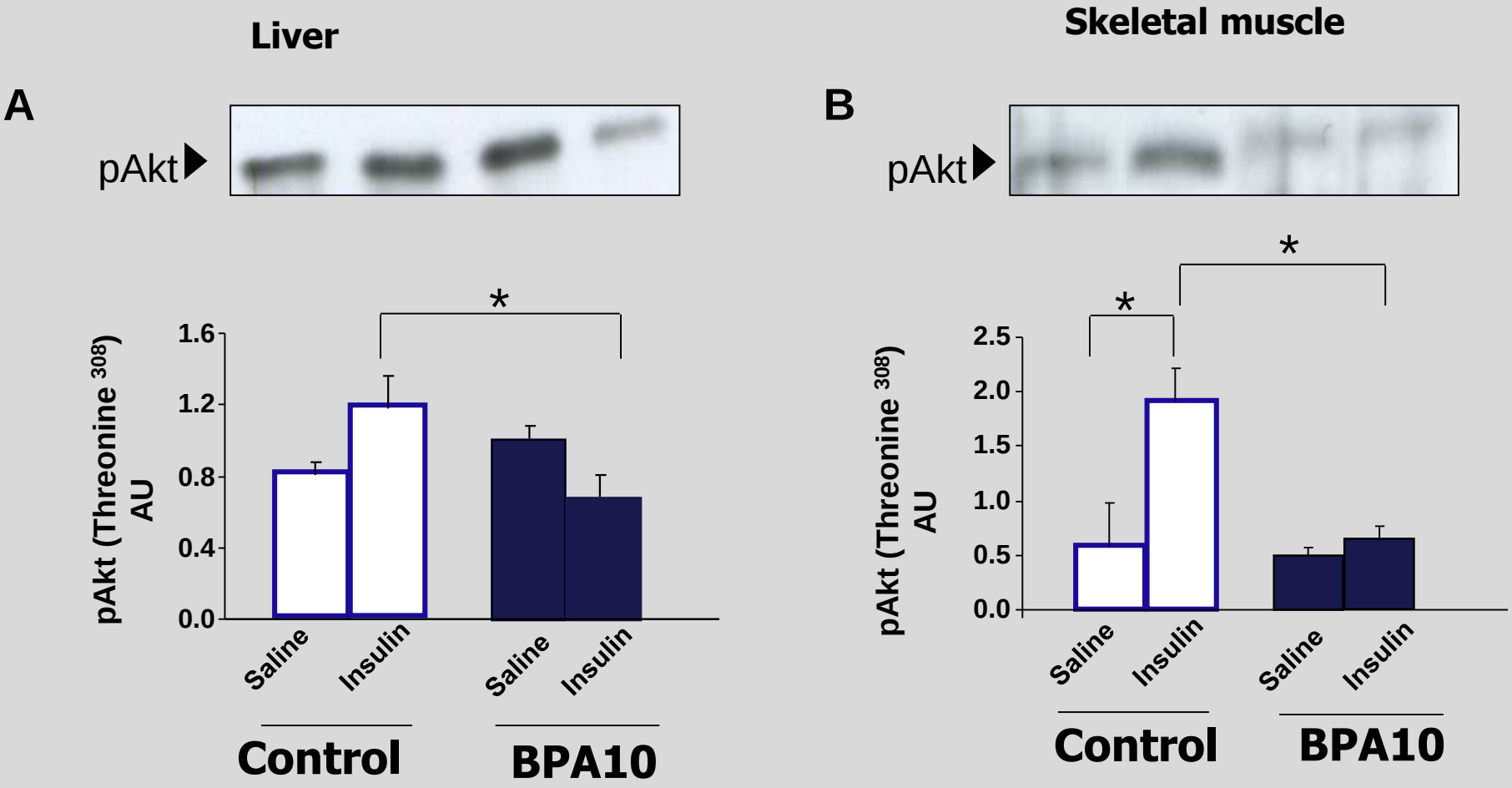



## GLUCOSE TOLERANCE TEST

*Alonso-Magdalena et al, EHP 2010*

# Insulin signaling in BPA-10 pregnant treated mice




***Bisphenol-A alters glucose and lipid metabolism during pregnancy***

*Alonso-Magdalena et al, Environ Health Perspect 2010*

# EVOLUTION OF THE MOTHER AFTER DELIVERY


3 Months after labor

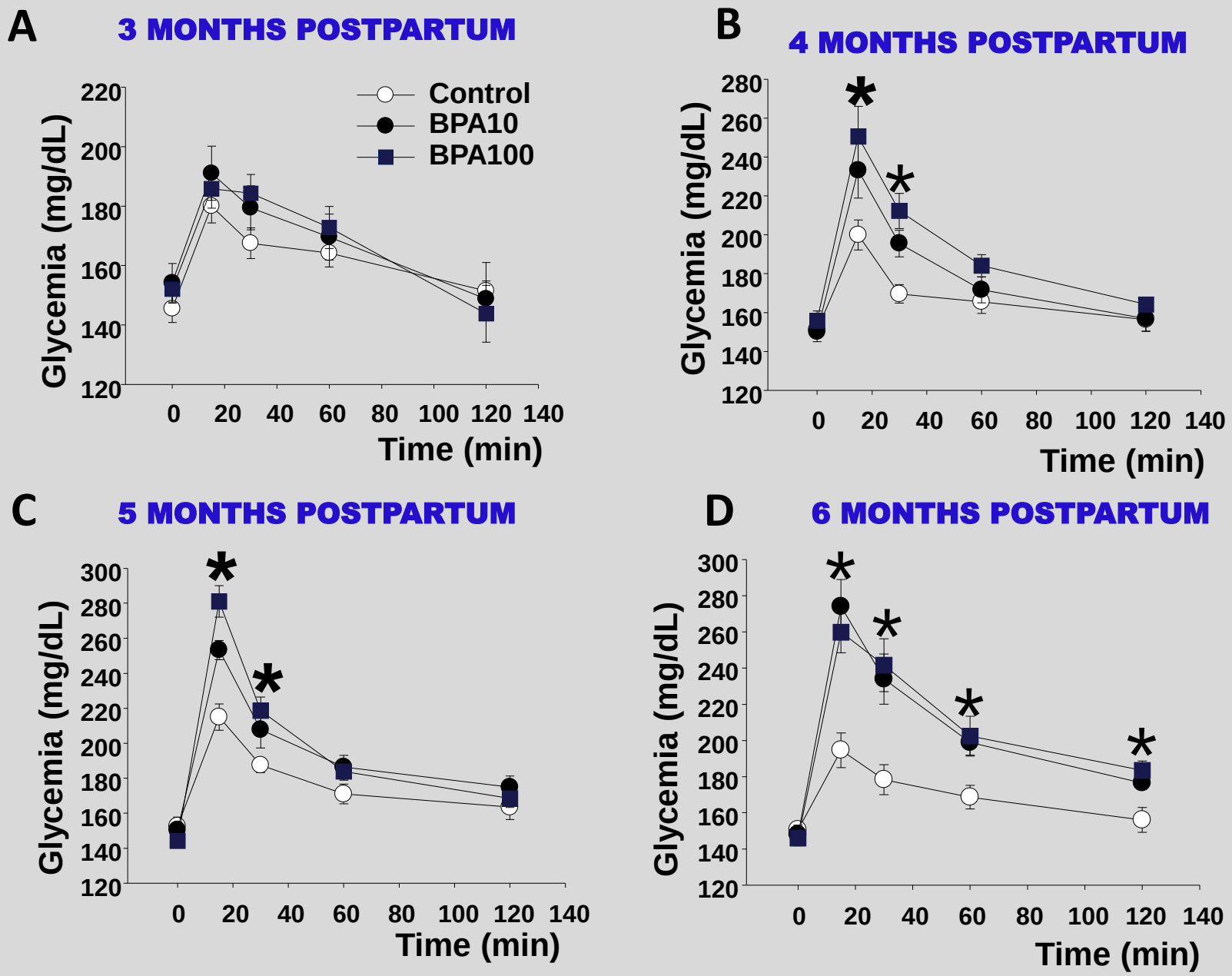
4 Months after labor

5 Months after labor

6 Months after labor

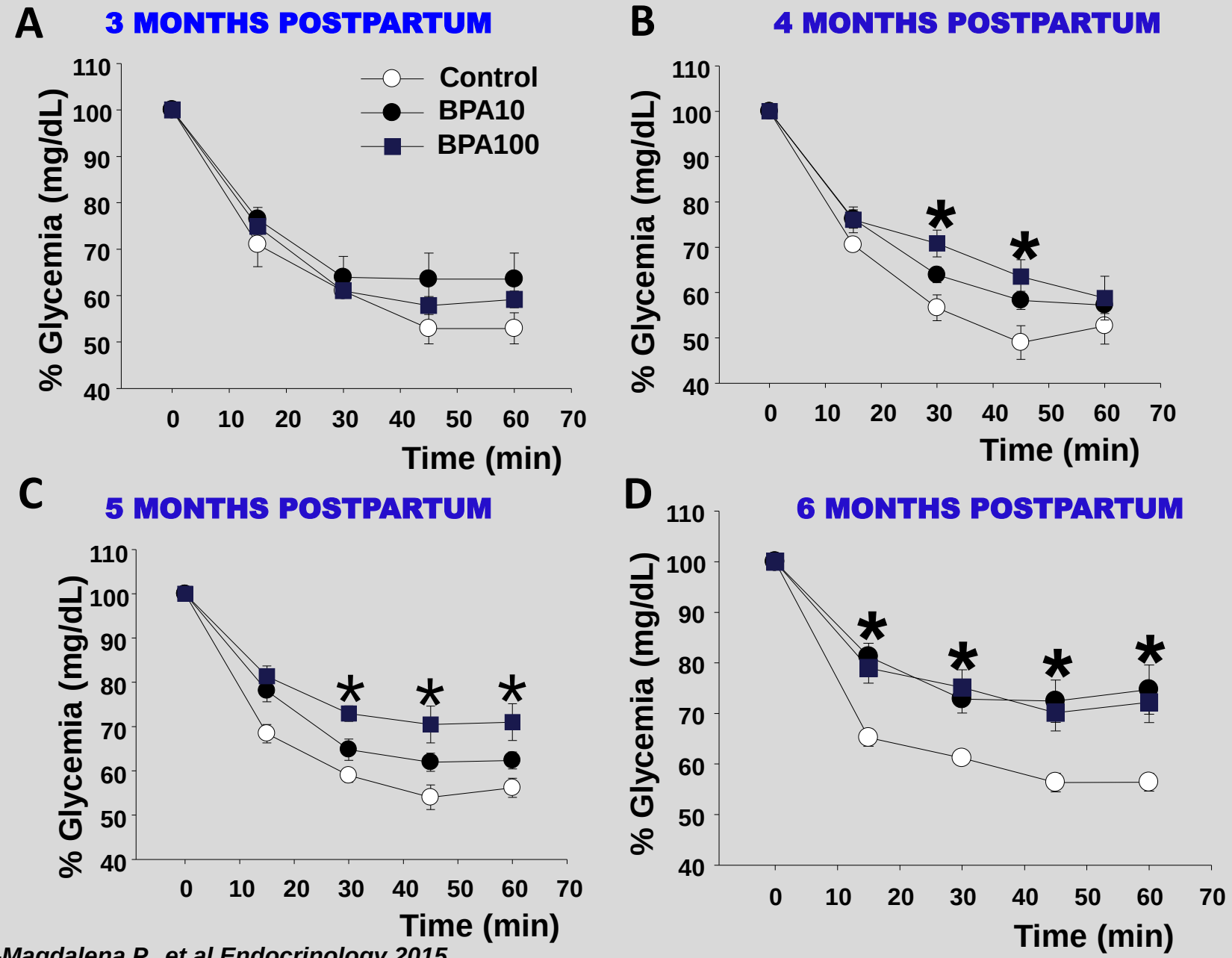
7 Months after labor

# GLUCOSE TOLERANCE TEST in the mother after labor



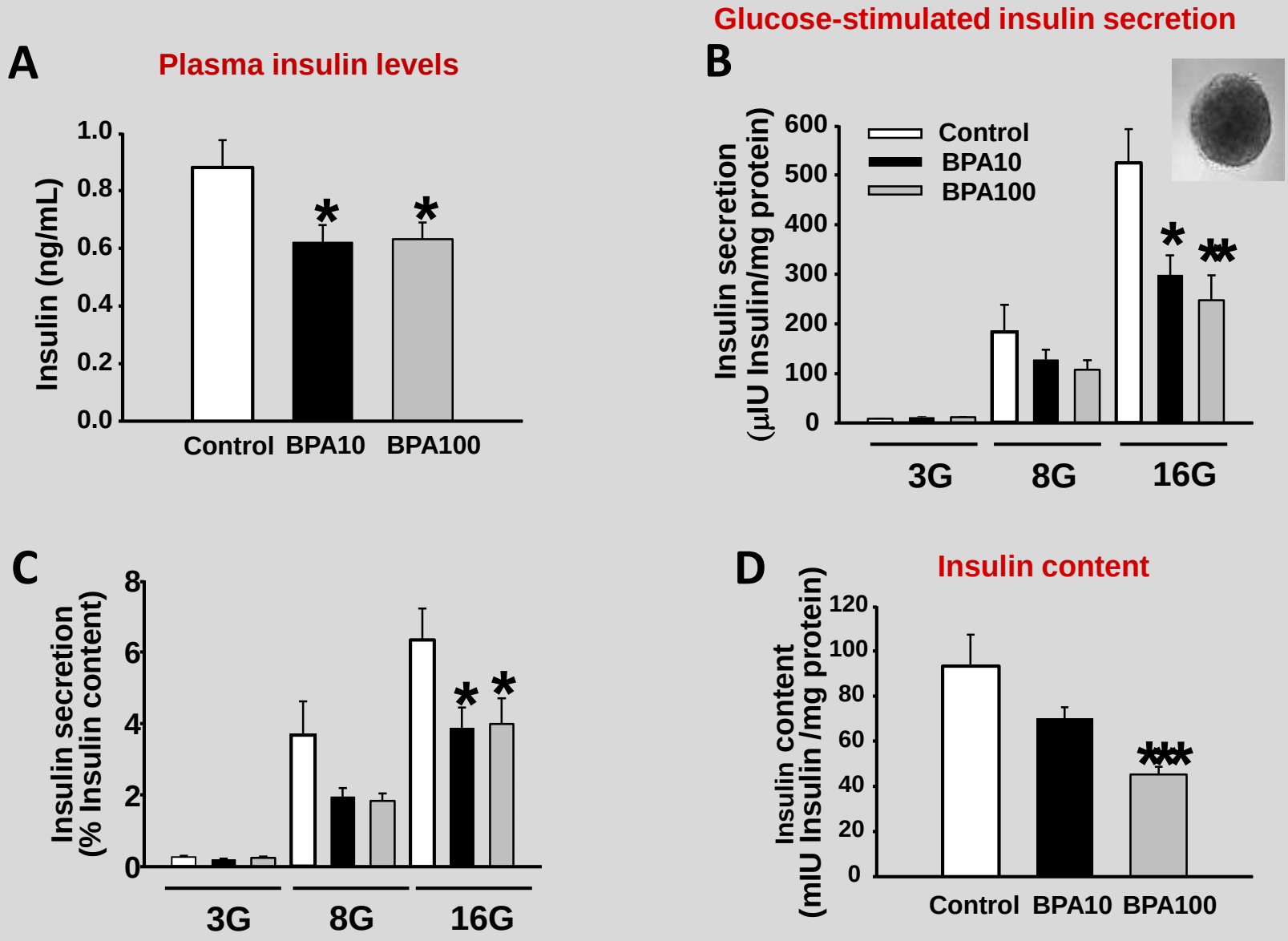

*Alonso-Magdalena P. et al Endocrinology 2015*

# INSULIN TOLERANCE TEST in the mother after labor



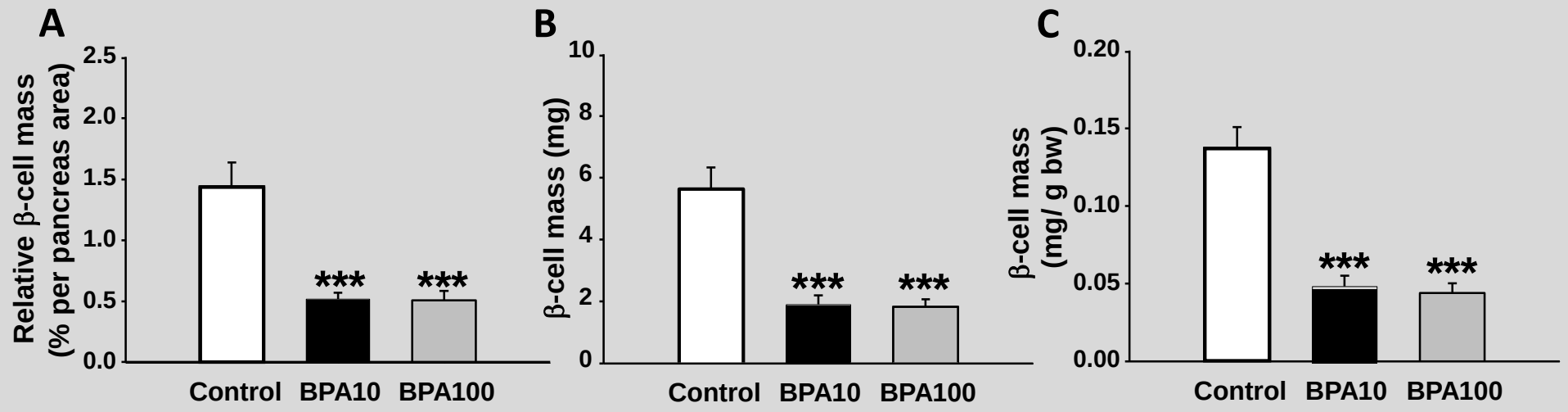

*Alonso-Magdalena P. et al Endocrinology 2015*

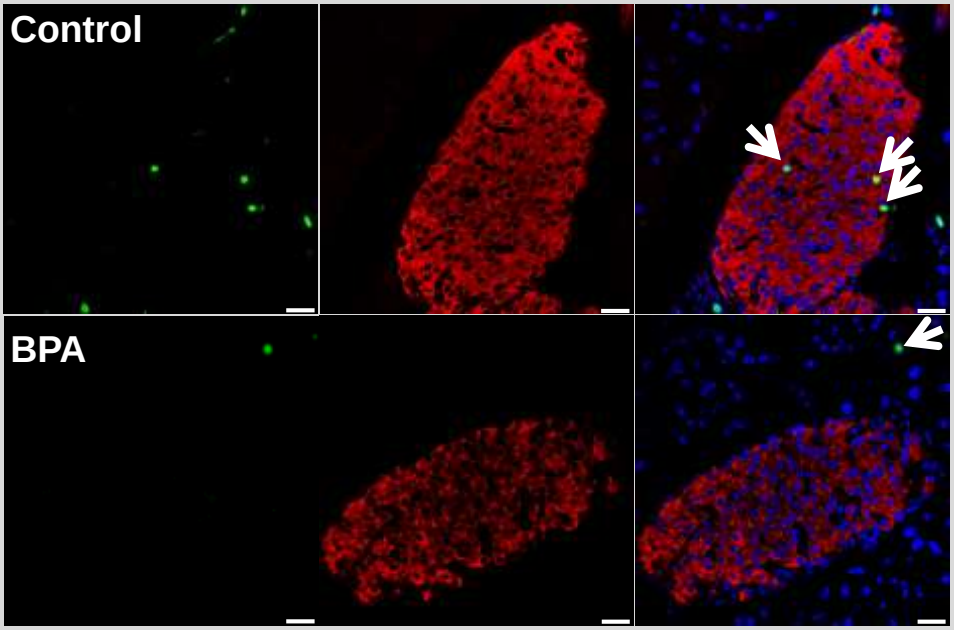
# Seven months after labor mothers that have been treated with BPA show a decline of pancreatic β-cell function

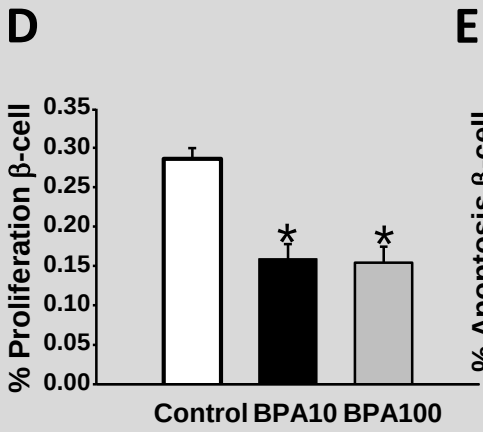


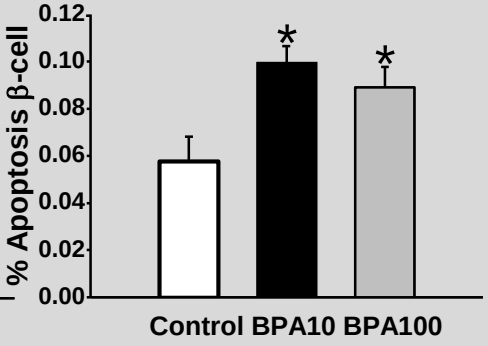

*Alonso-Magdalena P. et al Endocrinology 2015*

# Seven months after labor mothers that have been treated with BPA show reduced β-cell mass, reduced β-cell proliferation and increase rate of apoptosis

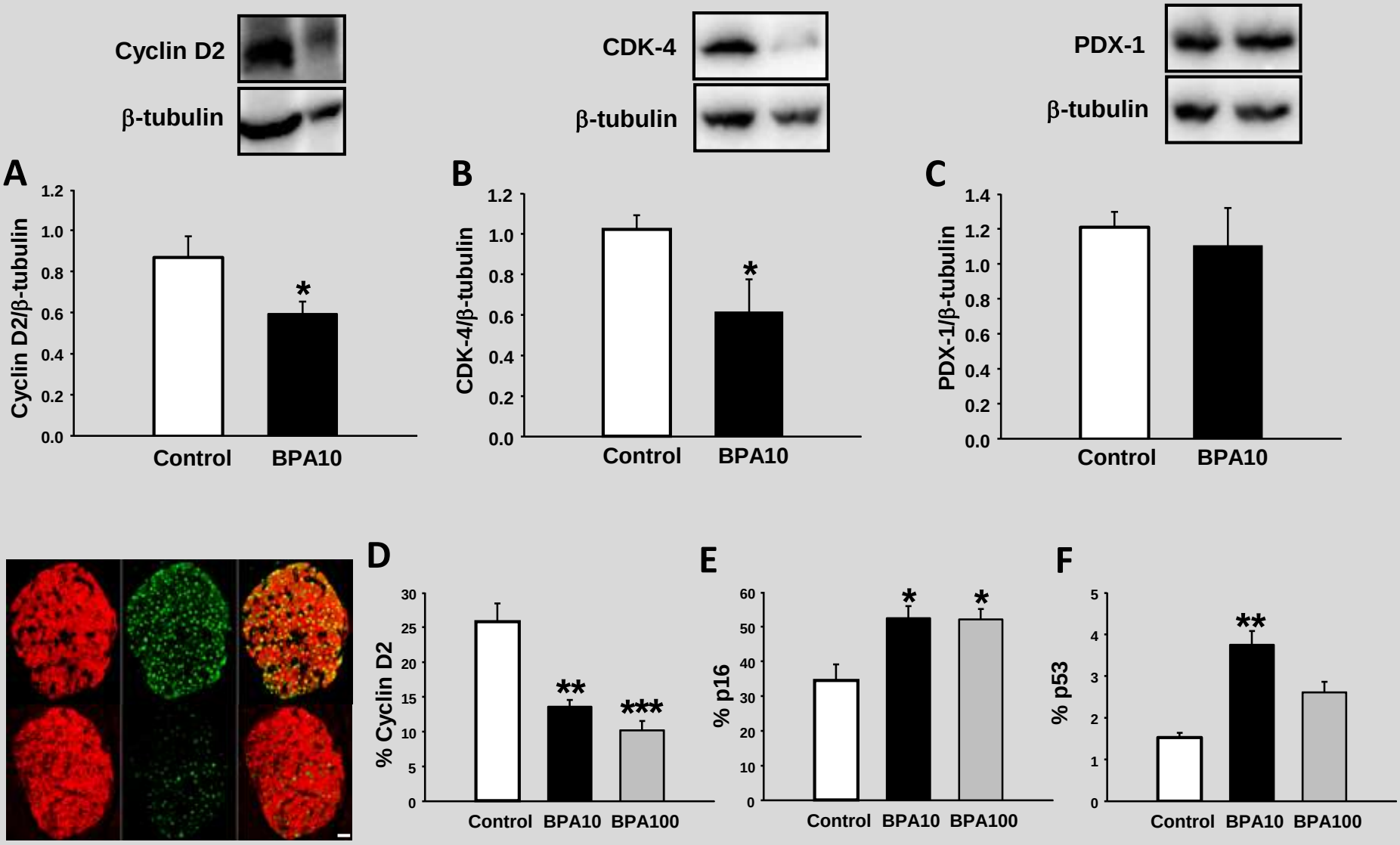



*Alonso-Magdalena P. et al Endocrinology 2015*




*Alonso-Magdalena P. et al Endocrinology 2015*

- **BPA exposure in mice during pregnancy resulted in an impairment of glucose tolerance and decreased insulin sensitivity in mothers.**

- **Alterations on glucose metabolism were resolved after parturition but were triggered again some months later**

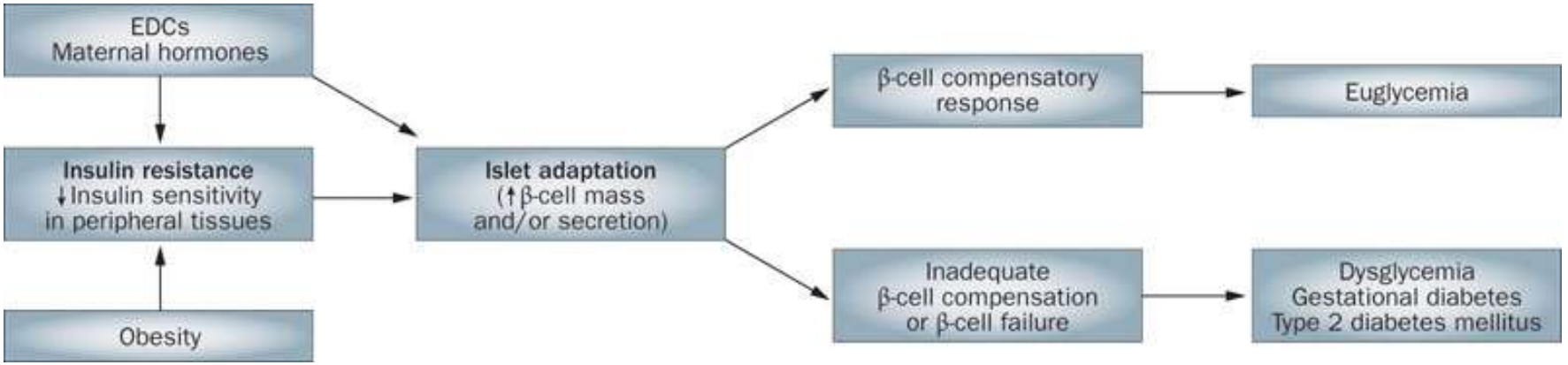
- **Six months after delivery those moms that have been treated with BPA during pregnancy exhibited marked glucose intolerance and insulin resistance**

- **Seven months after delivery they showed decrease β-cell function, β-cell mass and increased apoptosis.**

- **They also showed an altered expression of several cell cycle regulators.**

- **BPA exposure during pregnancy could be considered a new risk factor for the deterioration of maternal glucose metabolism and the increased occurrence of diabetes**

**Figure 1** Pregnancy-like actions of endocrine disrupting chemicals on islet function and glucose homeostasis




Alonso-Magdalena, P. *et al*. (2011) Endocrine disruptors in the etiology of type 2 diabetes mellitus
*Nat. Rev. Endocrinol.* doi:10.1038/nrendo.2011.56

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