EFFECT OF SELECTED FOOD AND MEDICAL PLANTS AND PLANT MOLECULES ON OVARIAN FUNCTIONS

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Food

Supply with energy (calories)
Supply with structural elements (proteins, lipids, carbohydrates)
Supply with regulatory molecules (antioxidants, phytohormones etc.)

Hormones

Intracellular regulators of cell proliferation, apoptosis, differentiation

Physiological state and health
FOOD REGULATORY MOLECULES AND REPRODUCTION:

- can food plants affect reproductive functions?

- what can be endocrine and intracellular mechanisms of such action?

- what for plant molecules are responsible for their action?

- can some food plants jeopardize or improve reproduction?
AIMS OF THE STUDY: to examine

- the effect of some food plants (curcuma/turmeric, green tea, rooibos, ginkgo, flaxseed, yucca) and their components - phytoestrogens and antioxidants (resveratrol, quercetin, daidzein, diosgenin) on ovarian cell functions

- mechanisms of action: whether these additives work through changes in hormones release, cell proliferation, apoptosis or response to hormonal stimulators

- application of some plants to improve reproduction
**MATERIAL & METHODS**

**A. Species:**
- pigs
- rabbits

**B. Objects:**
- living animals
- ovarian granulosa cells
MATERIAL & METHODS

C. Manipulations:

 Treatments with:
- **plant extracts** (curcumin, green tea, rooibos, ginkgo, flaxseed, yucca)
- **plant molecules** (resveratrol, quercetin, daidzein, diosgenin)
- **hormones** (FSH, IGF-I) + plants and plant molecules

Analysis:
reproduction, proliferation, apoptosis, hormones release (RIA, Western, immunocytochemistry, RT-PCR a.o.)
CAN FOOD PLANTS (curcumin, green tea, rooibos, flaxseed, ginkgo, yucca etc.) DIRECTLY AFFECT OVARIAN CELL FUNCTIONS?
Curcumin reduces ovarian cell proliferation:

- accumulation of PCNA

- accumulation of PCNA mRNA
Curcumin promotes ovarian cell apoptosis:

- accumulation of bax

- accumulation of bax mRNA
Curcumin promotes the release of hormones:

- progesterone

- testosterone
Ovarian cell proliferation (accumulation of PCNA) is inhibited with:

- rooibos
- ginkgo
- flaxseed
- green tea
Ovarian cell apoptosis (accumulation of bax) is promoted with:

- rooibos
- ginkgo
- flaxseed
- green tea
Ovarian cell leptin release is inhibited with:

- **rooibos**

  ![Graph showing inhibition of leptin release with rooibos dosage](image)

- **ginkgo**

  ![Graph showing inhibition of leptin release with ginkgo dosage](image)

- **flaxseed**

  ![Graph showing inhibition of leptin release with flaxseed dosage](image)
Ovarian cell progesterone release is inhibited with:

- rooibos
- ginkgo

is stimulated with:

- green tea
- yucca
FOOD PLANTS CONTAIN PHYTOESTROGENS AND ANTIOXIDANTS - resveratrol, quercetin, diosgenin, daidzein.

CAN THE PLANT ACTION BE EXPLAINED BY THE PRESENCE OF THESE MOLECULES?

DO PLANT EXTRACTS AND PLANT MOLECULES HAVE SIMILAR ACTION?
Resveratrol

- inhibits proliferation (accumulation of PCNA)

- promotes apoptosis (accumulation of bax)

- Inhibits release of progesterone
Quercetin

- inhibits proliferation
  (accumulation of PCNA)

- promotes apoptosis
  (accumulation of bax)
Diosgenin:

- promotes proliferation
  (accumulation of PCNA)

- promotes apoptosis
  (accumulation of bax)
Daidzein:
- promotes proliferation (accumulation of PCNA)
- promotes apoptosis (accumulation of bax)
- Inhibits release of progesterone
CAN PLANTS AND PLANT MOLECULES AFFECT OVARIAN RESPONSE TO HORMONAL STIMULATORS?
Daidzein blocks the stimulatory effect of FSH on:

- proliferation (accumulation of PCNA)
- release of progesterone
- release of leptin
Quercetin blocks the stimulatory action of FSH on ovarian cell proliferation (accumulation of PCNA)
Resveratrol blocks the stimulatory effect of FSH on the release of:

- progesterone

- testosterone
Curcumin blocks the anti-apoptotic effect of IGF-I
Green tea blocks the stimulatory effect of IGF-I on progesterone release
CAN PLANT PRODUCTS BE USED FOR IMPROVEMENT HORMONAL AND REPRODUCTIVE STATE?
Addition of yucca can promote hormones release by cultured rabbit ovarian tissue:

- progesterone
- testosterone
- estradiol
Feeding with yucca increases rabbit plasma level of

- oxytocin

- prostaglandin F

- prostaglandin E
Feeding with yucca increases rabbit

- conception rate

- kindling rate
1. Food plants curcuma/turmeric, green tea, rooibos, ginkgo, flaxseed can directly suppress ovarian cell functions via

- inhibition of proliferation,
- promotion of apoptosis,
- change in steroid and peptide hormone release
- blockage of response to upstream hormonal stimulators (FSH, IGF-I).
CONCLUSIONS:

2. Phytoestrogens and antioxidants resveratrol and quercetin act similar to curcuma, green tea, rooibos, ginkgo and flaxseed.

Can be active component of food plants?
CONCLUSIONS:

3. Phytoestrogens and antioxidants daidzein and diosgenin have both stimulatory and inhibitory effect on ovarian cell functions:

- promote proliferation
- promote apoptosis
- suppress progesterone release
- suppress the response to FSH

Not responsible for the main food plant effect?
CONCLUSIONS:

4. Yucca promotes

- steroid and peptide hormones release both \textit{in vivo} and \textit{in vitro}

- fertility (conception and kindling rate).

Can be useful for improvement reproduction?
COLLABORATION

A. Kadasi, A. Stochmalova, A. Alexa, M. Foldesiova, A. Balazi, P. Chrenek (Slovakia)

R. Grossmann (Germany)

J. Kotwica (Poland)
THANK YOU!
Some effects of nutrition on physiological state

Low calories diet
- delays puberty
- prolongs duration of life
- activates immune system
- prevents and inhibits infectious diseases, depressions, metabolic disorders, reproductive disorders and infertility, cancer.
Some effects of nutrition on physiological state

Phytoestrogens

- stimulate puberty
- Inhibit some metabolic (osteoporosis) and psychic (depression, aggressivity) diseases
- promote inflammation
- promote or suppress reproductive disorders (meno- and andropause, infertility, ovulatory cycles)
- promote or suppress cancer
Inhibited effect of resveratrol and rapamycin on the expression of PCNA.
RESULTS

Stimulated effect of resveratrol and rapamycin on the expression of bax.

- *Results*

- 70

- 75

- * *

- 80

- 90

- * *

- * *

- 45

- 50

- 55

- 60

- 65

- 70

- 75

- 40

- 50

- 60

- 70

- 80

- 90

- Resveratrol dose added (µg ml\(^{-1}\) medium)

- Rapamycin dose added (µg ml\(^{-1}\) medium)
RESULTS

Inhibited effect of resveratrol and rapamycin on progesterone release.

![Graph showing inhibited effect of resveratrol and rapamycin on progesterone release.](image)
Results

Stimulated effect of resveratrol on testosterone release.

Effect of rapamycin on testosterone release was not found.

[Graph showing stimulated effect of resveratrol on testosterone release.]

[Graph showing effect of rapamycin on testosterone release was not found.]
Resveratrol:

- inhibits the release of progesterone

- promotes the release of testosterone
Resveratrol inhibits proliferation (accumulation of PCNA) of ovarian cells

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<th>Davka resveratrolu</th>
<th>% buniek obsahujúcich PCNA</th>
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