# ADAPTAÇÕES GRAVÍDICAS DOS SISTEMAS GASTROINTESTINAL E UROGENITAL



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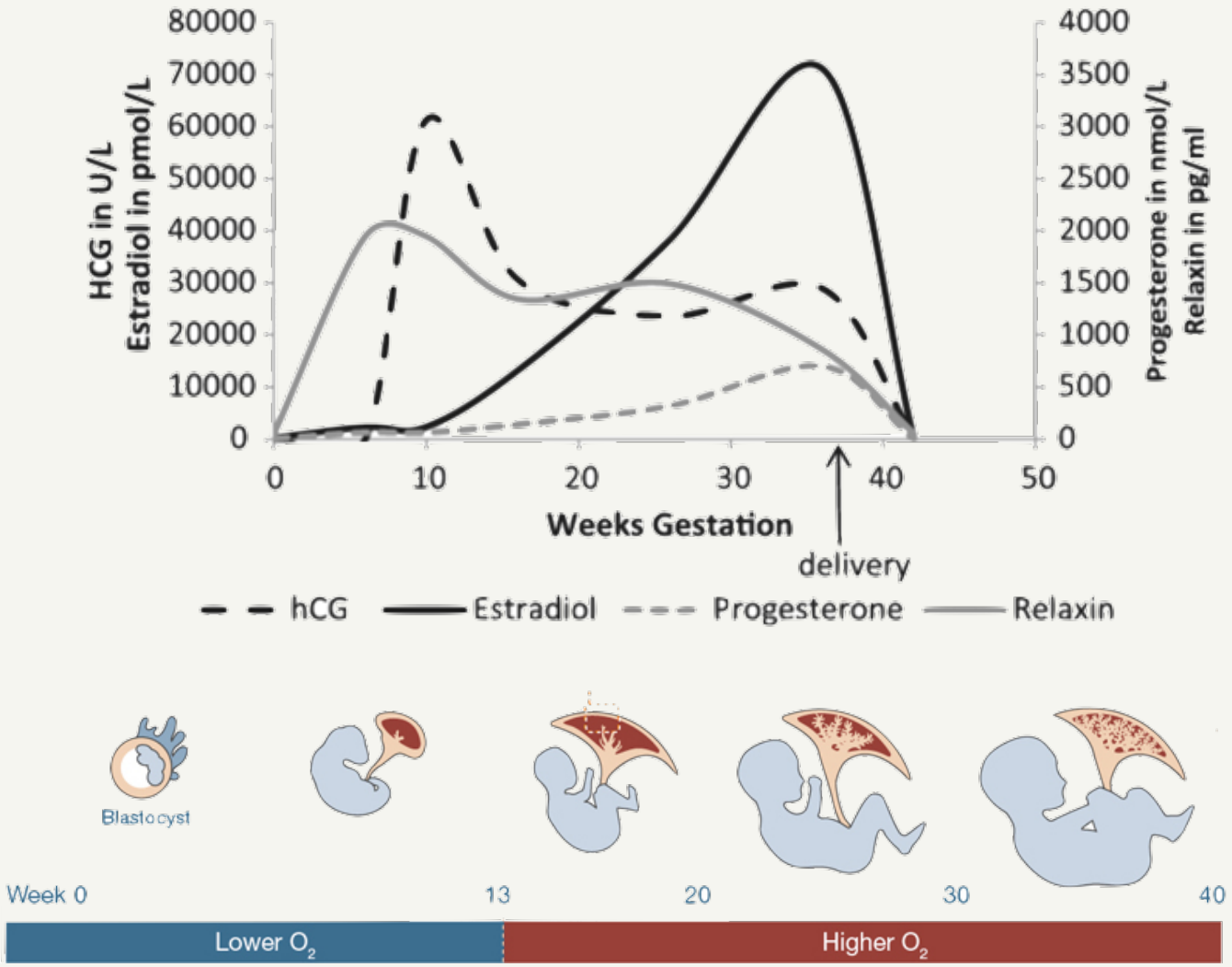

HCG in U/L
Estradiol in pmol/L
80000
70000
60000
50000
40000
30000
20000
10000
0
4000
3500
3000
2500
2000
1500
1000
500
0
Progesterone in nmol/L
Relaxin in pg/ml
0
10
20
30
40
50
Weeks Gestation
delivery
hCG
Estradiol
Progesterone
Relaxin
Blastocyst
Week 0
13
20
30
40
Lower $O_2$
Higher $O_2$

1

Náuseas
e vômitos

2

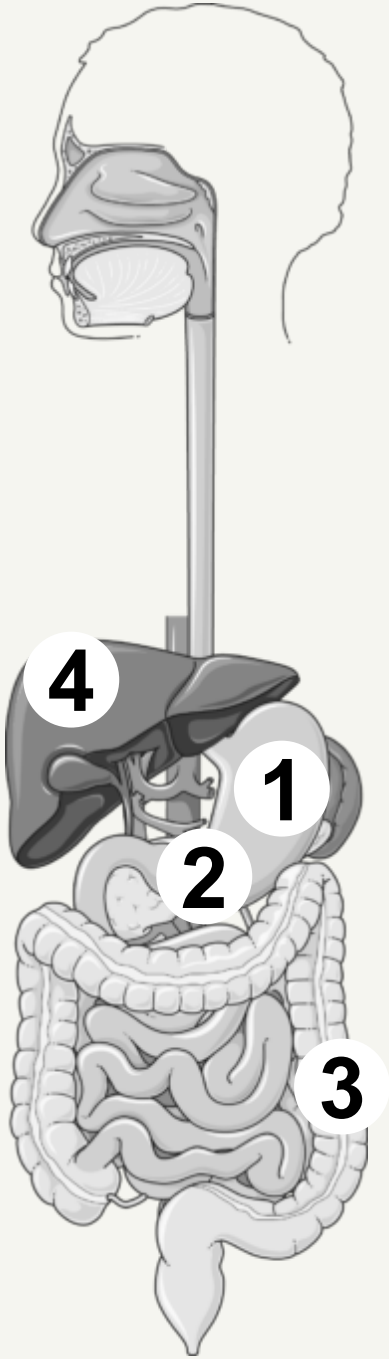
Refluxo

3

Constipação

4

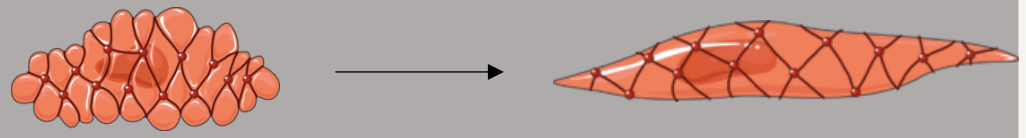
Alterações
metabólicas



# 1 Náuseas e vômitos

- Náuseas e/ou vômitos acometem de 50-80% das gestantes.


↑ Progesterona



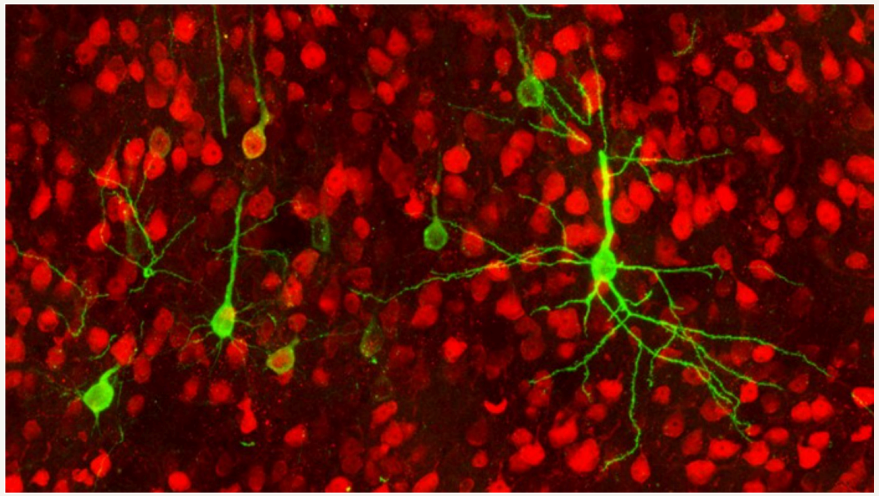
↑ Relaxamento da musculatura lisa

↑ Gastrina

↑ Acidez gástrica

# 1 Náuseas e vômitos

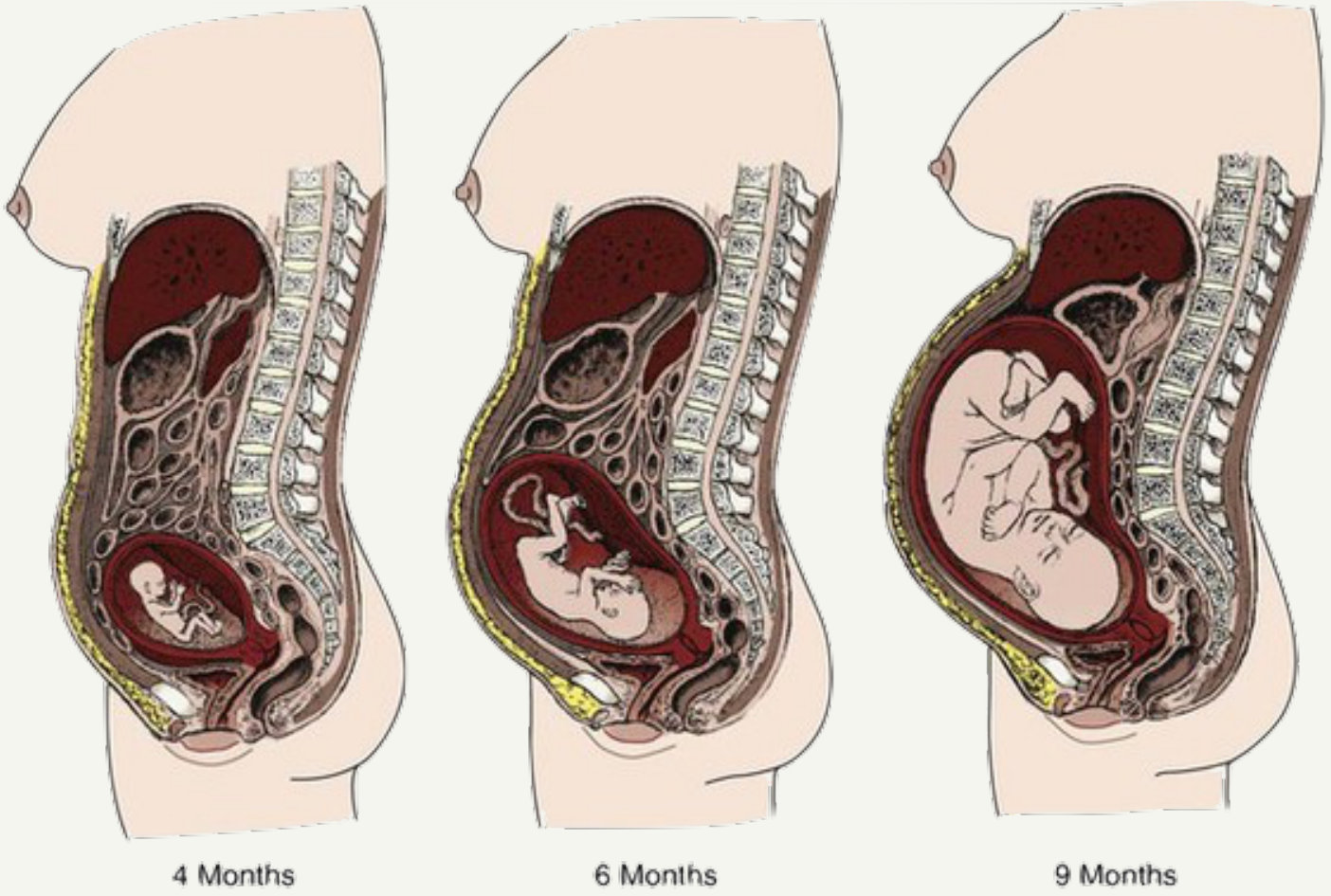
- Náuseas e vômitos possuem relação com o SNC (fatores psicológicos, cheiro, etc).
- A maioria das mulheres não precisa de tratamento farmacológico. Recomenda-se alimentação fracionada e evitar o consumo de comidas gordurosas.
- Os sintomas normalmente desaparecem, mas podem evoluir para hiperemese gravídica, associada a vômitos persistentes, desidratação e desnutrição. Em casos graves, necessita de hospitalização.



Neurons (green) in a brain region called the insula send projections to the stomach. Credit: David Levinthal and Peter Strick. Nature, May 2020.

## 2 Refluxo

## 3 Constipação




↑ Progesterona

Relaxamento da musculatura lisa

Compressão gastrointestinal pelas modificações das relações anatômicas

# 4 Alterações metabólicas

- O fígado aumenta sua atividade de síntese.
- Maior níveis séricos de algumas proteínas e colesterol.

**Table 10.5.** Variations in the measured concentrations of markers of hepatic synthetic activity

| Serum analyte | Non-pregnant adult | First trimester | Second trimester | Third trimester |
|---|---|---|---|---|
| Alanine transaminase (U/L [µkat/L]) | 0–35 (0–0.58) | 3–30 (0.05–0.5) | 2–33 (0.03–0.55) | 2–25 (0.03–0.42) |
| Albumin (g/L) | 35–55 | 31–51 | 26–45 | 23–42 |
| Alkaline phosphatase (U/L [nkat/L]) | 30–120 (0.5–2.0) | 17–88 (0.28–1.47) | 25–126 (0.42–2.1) | 38–229 (0.63–3.82) |
| Alpha-1 antitrypsin (g/L) | 0.8–2.1 | 2.2–3.2 | 2.7–3.9 | 3.3–4.9 |
| Asparatate transaminase (U/L [µkat/L]) | 0–35 (0–0.58) | 3–23 (0.05–0.38) | 3–33 (0.03–0.55) | 4–32 (0.07–0.53) |
| Bilirubin, total (mmol/L [mg/dL]) | 5.1–17.0 (0.3–1.0) | 1.7–6.8 (0.1–0.4) | 1.7–13.7 (0.1–0.8) | 1.7–18.8 (0.1–1.1) |
| Bilirubin, unconjugated (mmol/L [mg/dL]) | 1.7–5.1 (0.1–0.3) | 1.7–8.5 (0.1–0.5) | 1.7–6.8 (0.1–0.4) | 1.7–8.5 (0.1–0.5) |
| Bilirubin, conjugated (mmol/L [mg/dL]) | 3.4–12.0 (0.2–0.7) | 0–1.7 (0–0.1) | 0–1.7 (0–0.1) | (0–1.7 (0–0.1) |
| Ceruloplasmin (mg/L) | 270–370 | 300–490 | 400–530 | 430–780 |
| Gamma-glutamyl transpeptidase (U/L) | 1–94 | 2–23 | 4–22 | 3–26 |
| Lactate dehydrogenase (U/L [µkat/L]) | 100–190 (1.7–3.2) | 78–433 (1.3–7.2) | 80–447 (1.3–7.5) | 82–524 (1.4–8.7) |
| Prealbumin (mg/L) | 195–358 | 150–270 | 200–270 | 140–230 |
| Protein, total (g/L) | 55–80 | 62–76 | 57–69 | 56–67 |

*Sources*: Kratz, *et al.*, 2004 [3]; Abbassi-Ghanavati, *et al.*, 2009 [4].

**Table 10.6.** Lipid, vitamin and mineral concentrations during pregnancy

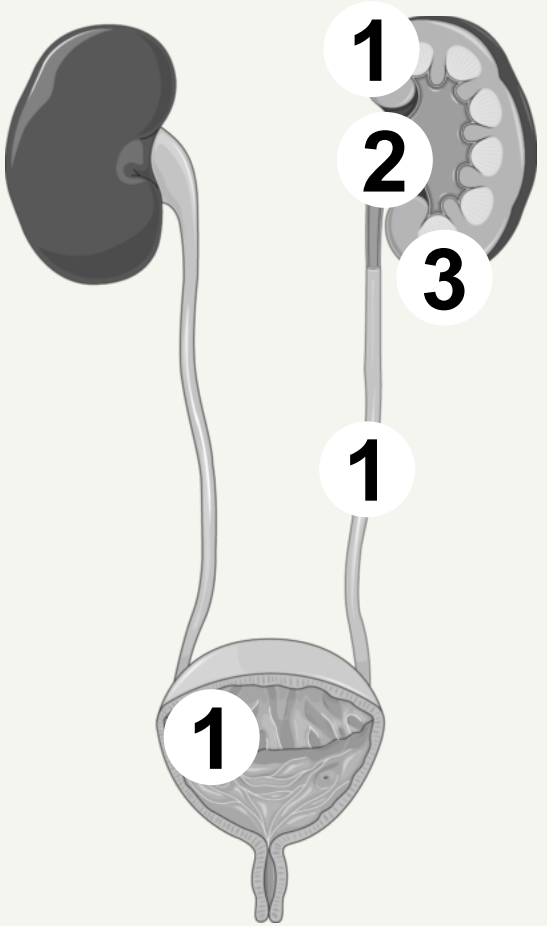
| Serum analyte | Non-pregnant adult | First trimester | Second trimester | Third trimester |
|---|---|---|---|---|
| Cholesterol, total (mmol/L [mg/dL]) | <5.17 (<200) | 3.65–5.44 (141–210) | 4.56–7.74 (176–299) | 5.67–9.04 (219–349) |
| High density lipoprotein-cholesterol (mmol/L [mg/dL]) | 1.03–1.55 (40–60) | 1.03–2.02 (40–78) | 1.35–2.25 (52–87) | 1.24–2.25 (48–87) |
| Low density lipoprotein-cholesterol (mmol/L [mg/dL]) | <2.59 (<100) | 1.55–3.96 (60–153) | 1.99–4.77 (77–184) | 2.62–5.80 (101–224) |
| Very low density lipoprotein-cholesterol (mmol/L [mg/dL]) | 0.16–1.04 (6–40) | 0.26–0.47 (10–18) | 0.34–0.60 (13–23) | 0.54–0.93 (21–36) |
| Triglyceride (mmol/L [mg/dL]) | <1.8 (<160) | 1.0–4.1 (40–159) | 1.9–9.9 (75–382) | 3.4–11.7 (131–453) |
| Apolipoprotein A1 (g/L) | 1.2–2.4 | 1.1–1.5 | 1.4–2.5 | 1.4–2.6 |
| Apolipoprotein B (g/L) | 0.52–1.63 | 0.58–0.81 | 0.66–1.88 | 0.85–2.38 |
| Retinol (vitamin A) (µmol/L [µg/dL]) | 0.7–3.5 (20–100) | 1.1–1.6 (32–47) | 1.2–1.5 (35–44) | 1.0–1.5 (29–42) |
| Vitamin $B_{12}$ (pmol/L [ng/dL]) | 205–712 (27.9–96.6) | 87–323 (11.8–43.8) | 96–484 (13.0–65.6) | 73–388 (9.9–52.6) |
| Ascorbic acid (vitamin C) (µmol/L [mg/dL]) | 23–57 (0.4–1.0) | Not reported | Not reported | 51–74 (0.9–1.3) |
| 1,25-Dihydroxyvitamin D (pmol/L [ng/dL]) | 60–108 (2.5–4.5) | 52–169 (2.0–6.5) | 187–416 (7.2–16.0) | 156–309 (6.0–11.9) |
| 25-Dihydroxyvitamin D (nmol/L [µg/dL]) | 25–169 (1.0–6.8) | 45–67 (1.8–2.7) | 25–55 (1.0–2.2) | 25–45 (1.0–1.8) |
| Alpha-tocopherol (vitamin E) (µmol/L [mg/dL]) | 116–279 (0.5–1.8 | 162–302 (0.7–1.3 | 232–371 (1.0–1.6 | 302–534 (1.3–2.3 |
| Copper (µmol/L [µg/dL]) | 11–22 (70–140) | 18–31 (112–199) | 26–35 (165–221) | 20–38 (130–240) |
| Zinc (µmol/L [µg/dL]) | 11–18 (75–120) | 9–13 (57–88) | 8–12 (51–80) | 8–12 (50–77) |

*Sources*: Kratz, *et al.*, 2004 [3]; Abbassi-Ghanavati, *et al.*, 2009 [4].


Modificações Anatômicas

Função Renal

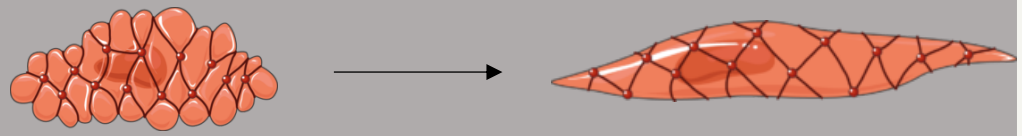
Fluidos e Metabólitos



# 1 Modificações Anatômicas

- Dilatação da pelve e dos rins ocorre de 43-100% das gestantes.

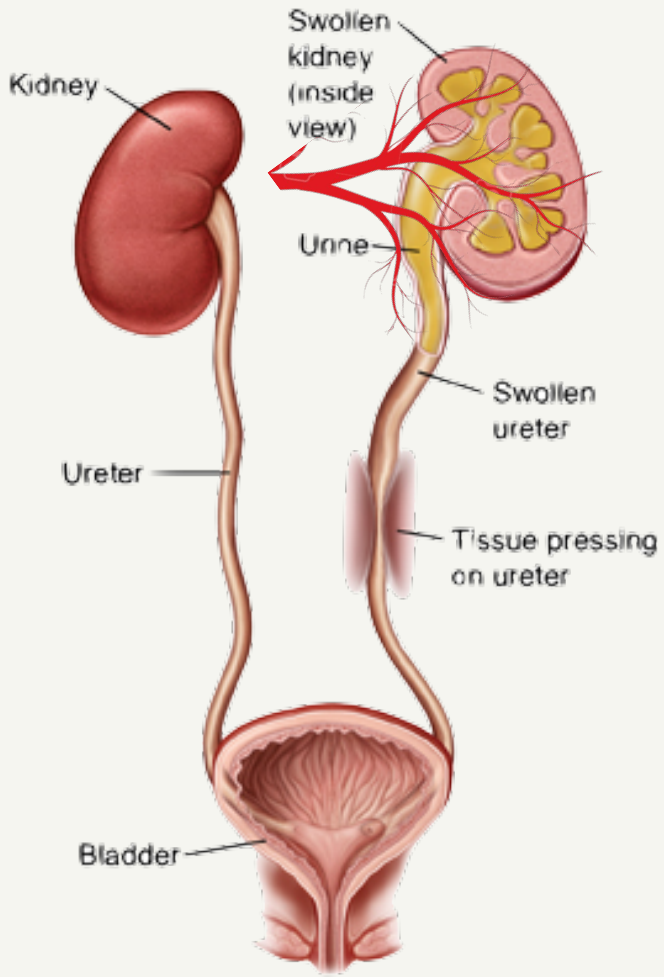
**↑ Progesterona**



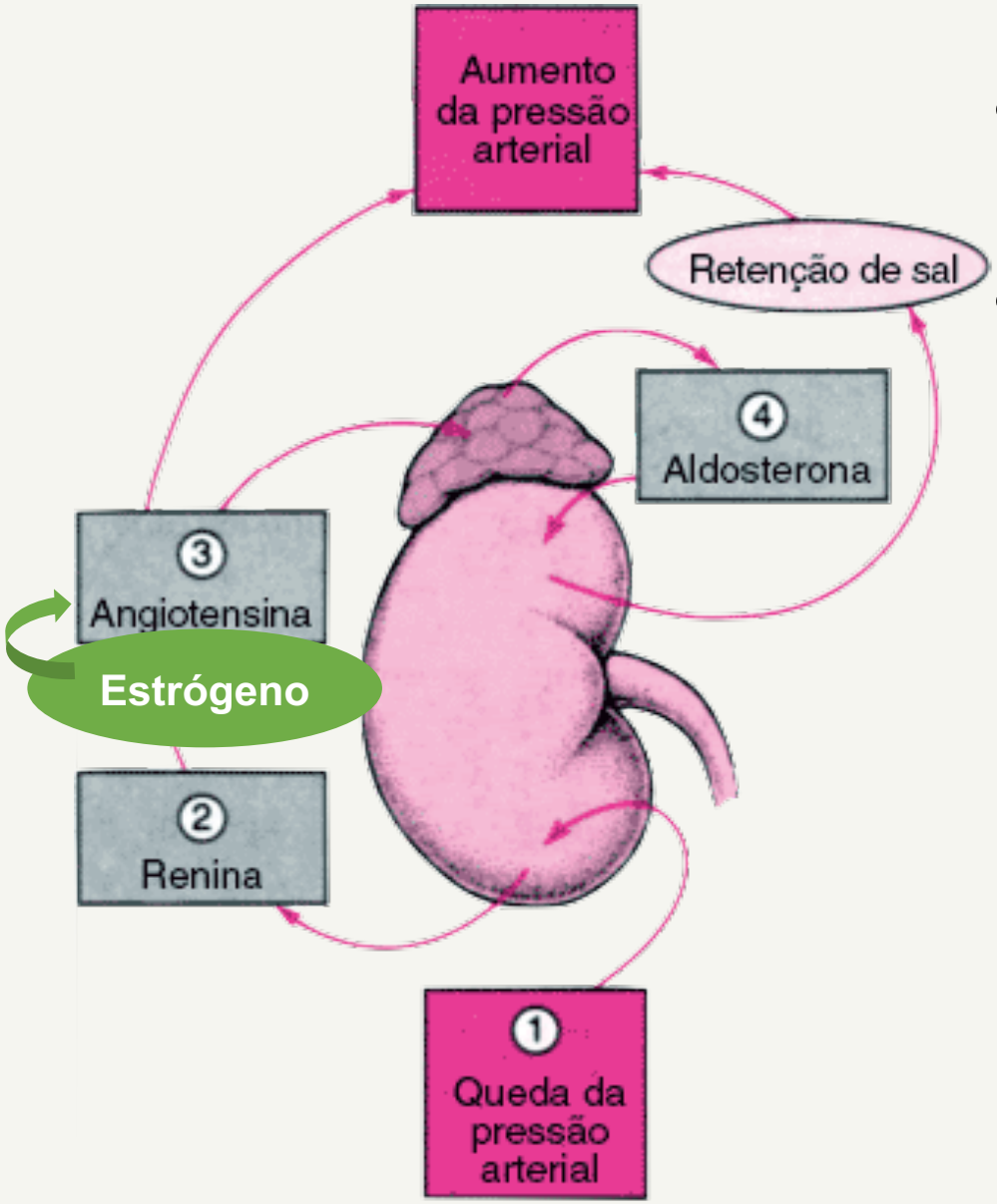
**↑ Relaxamento da musculatura lisa**

**↑ Vascular**

**Compressão mecânica pelas modificações das relações anatômicas**



# 2 Função renal




- Regulação positiva do Sistema Renina-Angiotensina-Aldosterona, pelo estrógeno.
- Aumenta a retenção de água.

# 2 Função renal

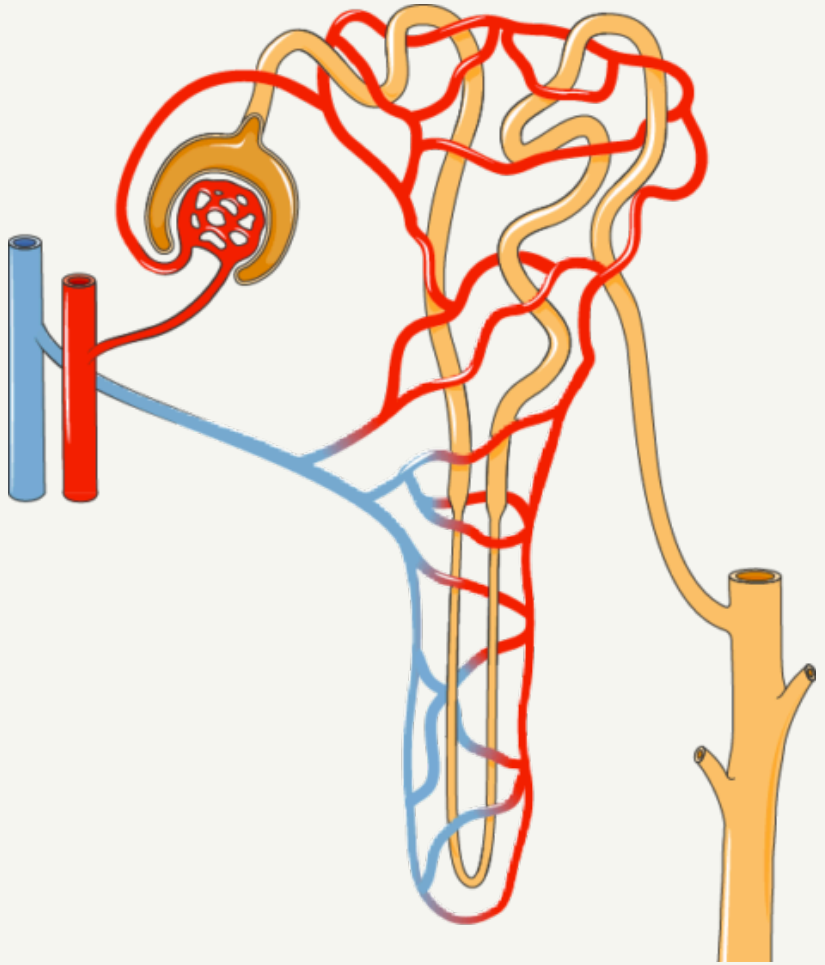
- Dilatação vascular e diminuição da pressão sanguínea (105/60mmHg)
- Aumento da filtração glomerular (níveis séricos menores de creatinina, uréia e ácido úrico)

↑ Relaxina

↑ Vasodilatação

↑ Progesterona

↑ Fluxo Plasmático Renal



## 3 Alteração de fluidos corporais

- Expansão do volume dos líquidos corporais (6-8L)
- Aumento do volume plasmático induzirá uma redução da osmolaridade sérica (8 – 10mOsm/kg)
- Como consequência, limite para sede e liberação de hormonio antidiurético é reduzido = aumento da ingestão e retenção de líquidos.

# 3 Alteração de fluidos corporais

- Alteração urinária de metabólitos

**Table 10.7.** Variations in measured concentrations of serum and urine analytes reflecting renal physiological adaptations

| Serum/urine analyte | Non-pregnant adult | First trimester | Second trimester | Third trimester |
|---|---|---|---|---|
| Creatinine (mmol/L [mg/dL]) | 38–69 (0.5–0.9) | 30–53 (0.4–0.7) | 30–61 (0.4–0.8) | 30–69 (0.4–0.9) |
| Urea nitrogen (mmol/L [mg/dL]) | 3.6–7.1 (10–20) | 2.5–4.3 (7–12) | 1.1–4.6 (3–13) | 1.1–3.9 (3–11) |
| Uric acid (mmol/L [mg/dL]) | 90–360 (1.5–6.0) | 119–250 (2.0–4.2) | 143–291 (2.4–4.9) | 184–375 (3.1–6.3) |
| Calcium excretion, 24 hour (mmol) | <7.5 | 1.6–5.2 | 0.3–6.9 | 0.8–4.2 |
| Creatinine excretion, 24 hour (mmol) | 8.8–1.4 | 10.6–11.6 | 10.3–11.5 | 10.2–11.4 |
| Potassium excretion, 24 hour (mmol) | 25–100 | 17–33 | 10–38 | 11–35 |
| Protein excretion, 24 hour (mg) | <150 | 19–141 | 47–186 | 46–185 |
| Sodium excretion, 24 hour (mmol) | 100–260 | 53–215 | 34–213 | 37–149 |

*Sources*: Kratz, *et al.*, 2004 [3]; Abbassi-Ghanavati, *et al.*, 2009 [4].

# Bibliografia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NIHMSID: NIHMS609376
PMID: 23928384

## Renal Physiology of Pregnancy

Katharine L. Cheung and Richard A. Lafayette

Ann Gastroenterol. 2018 Jul-Aug; 31(4): 385–394.
Published online 2018 Apr 27. doi: 10.20524/aog.2018.0264
PMCID: PMC6033757
PMID: 29991883

## Gastrointestinal diseases during pregnancy: what does the gastroenterologist need to know?

Catarina Frias Gomes,[a] Mónica Sousa,[b] Inês Lourenço,[c] Diana Martins,[c] and Joana Torres[a]

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