Food Intake and Reproduction

(and a review of general endocrinology)

- A neuroendocrine control system: components, a reflex arc, the endocrine system, the ANS, endocrine / nervous systems as afferents and efferents, the theoretical comparator or integrator unit, membrane potential, transcription factors and integrators, crosstalk at a subcellular level as regulatory control paradigm

- Elements involved in the neuroendocrine control of food intake, the hypothalamic PVN, ME and POA as integration centers, discussion of other integrated neuroendocrine systems (stress and temperature regulation linked to stress and food intake) and of obesity and anorexia

- Neuroendocrine control as a story of circles, intersecting circles, intersecting circles, intersecting ...

Food Intake and Reproduction

Energy production, utilization and storage
Maintenance of internal environment
Growth and development
Reproduction

The endocrine system is a communication system involved in homeostatic control of life. It acts through its hormones which control four main basic processes

A “basic reflex arc” model has organization levels, structure / function, control
Food Intake and Reproduction

Question #09: Control of food intake and reproduction
Your first draft report for this topic is due on Wed Nov 30. The question for this week is as follows:
Select a homeostatic event and/or physiological system involving food intake AND reproduction as your
structure, in which you can show the importance of structure/function relationship, levels of
organization, and feedback control. Your answer must follow the outline presented in the introduction
(sub-questions a, b, c, d, see above).

a) Name the structure and the function on which your overall answer will be based? Be as specific as
you can in delimiting the boundaries of your example (the most important part of your answer,
since the following b, c, & d sub-questions are based on your answer to this first sub-question, a).
b) Why do you think that your structure and your function are related? Support your contention based
on 3 lines of evidence on the chemistry, physics, anatomy or physiology involved in your example.
c) Which are the levels of organization involved in your example? Cite events occurring at its main
level of organization and indicate how they relate to the whole body homeostatic level.
d) Which are the main feedback mechanisms involved in your example (cite at least two)? Expand on
one of them and indicate an absolute requirement for that feedback to be operational.

A review of Endocrinology

A “basic reflex arc” is in the various hierarchies. An exception
is Ca homeostasis and a partial exception is the RAS system
Neuronal and hormonal elements are involved in communication operations within control systems.

A background for an integrator comes from the function of EPSP and IPSP, from cAMP, and from the effect of steroids.
Tertiary hypometabolic states (hibernation, starvation) show how integrators work:
- T3-T4 (low)
- TSH (low/normal)
- TRH mRNA (low)
- UC proteins (low)
- TRH-induced TSH release (high)
- TRH release (low)
- SS inhibits TSH release
- Insulin (low)
- Glucagon (high)
- Cortisol (high)
- Epinephrine (high)
- LH/FSH (low)
- Leptin (low)
- Cas, NPY, aMSH, ARN
- thermogenesis (low)
- energy expenditure (low)

A review of Endocrinology

Control of Food Intake

Ultimately how you look will result from your integrator’s “balancing act”. How many say “yes” and how many say “no”
Leptin acts both centrally and peripherally. Its ARN/ME receptors are located in NPY/AGRP and in POMC/CART containing cells.

Main central pathways regulating food intake. Leptin inhibits food intake and stimulates energy expenditure.
Control of Food Intake

Integrator’s “balancing act” where obesity and anorexia are only the extremes of the central integrators’ playfield

Control of Reproduction

Integrator’s “balancing act” where ovulation and anovulation are only the extremes of the central integrators’ playfield
Food Intake and Reproduction

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Select a homeostatic event and / or physiological system involving food intake AND reproduction as your structure, in which you can show the importance of structure / function relationship, levels of organization, and feedback control. Your answer must follow the outline presented in the introduction (sub-questions a, b, c, d, see above).

a) Name the structure and the function on which your overall answer will be based / see as specific as you can in delimiting the boundaries of your example (the most important part of your answer, since the following b, c, & d sub-questions are based on your answer to this first sub-question, a).

b) Why do you think that your structure and your function are related? Support your contention based on 3 lines of evidence on the chemistry, physics, anatomy or physiology involved in your example.

c) Which are the levels of organization involved in your example? Cite events occurring at its main level of organization and indicate how they relate to the whole body homeostatic level.

d) Which are the main feedback mechanisms involved in your example (cite at least two)? Expand on one of them and indicate an absolute requirement for that feedback to be operational.

Puberty, cyclicity and failures

structure

Which, increase or decrease?

function

a) How do you know?

b) Parts to total?

d) Two feedbacks and an absolute requirement?
Next week question

Question #10: Rhythms, reproduction, immunity and aging
Your first draft report for this topic is due on Dec 07. The question for this week is as follows:
Select a homeostatic event and/or physiological system involving rhythms, reproduction, immunity AND aging as your structure, in which you can show the importance of structure/function relationship, levels of organization, and feedback control. Your answer must follow the outline presented in the introduction (sub-questions a, b, c, d, see above).

   a) Name the structure and the function on which your overall answer will be based? Be as specific as you can in delimiting the boundaries of your example (the most important part of your answer, since the following b, c, & d sub-questions are based on your answer to this first sub-question, a).

   b) Why do you think that your structure and your function are related? Support your contention based on 3 lines of evidence on the chemistry, physics, anatomy or physiology involved in your example.

   c) Which are the levels of organization involved in your example? Cite events occurring at its main level of organization and indicate how they relate to the whole body homeostatic level.

   d) Which are the main feedback mechanisms involved in your example (cite at least two)? Expand on one of them and indicate an absolute requirement for that feedback to be operational.