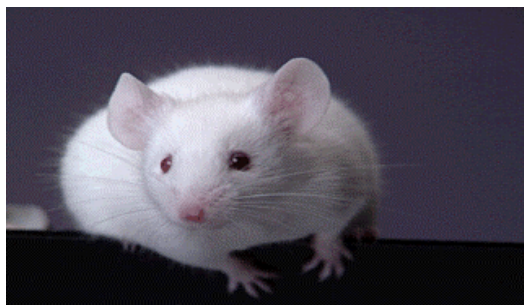


**Reparto di Neuroscienze comportamentali,
Dip. Biologia cellulare e Neuroscienze
Istituto Superiore di Sanità, Roma**

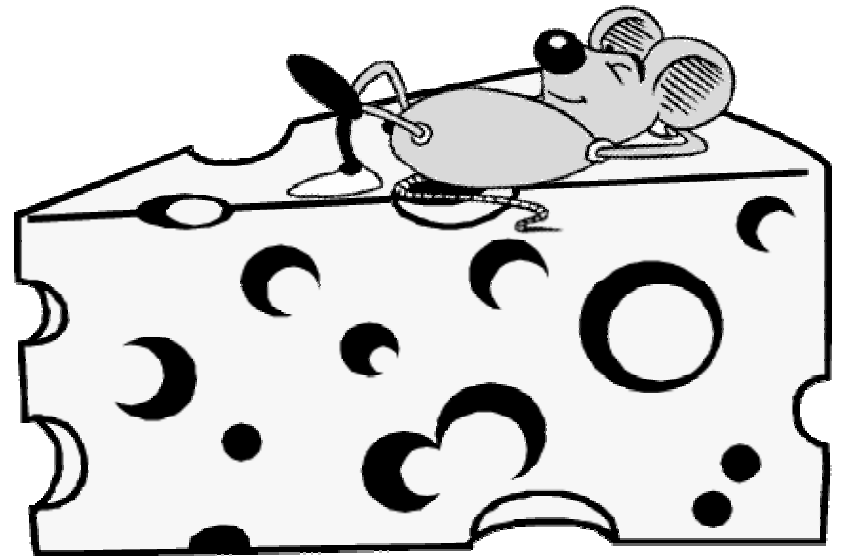


Animal Welfare



Is the mouse healthy?

**Does the mouse have what it
wants?**



Factors affecting phenotype

Genes...



... and environment





Standardization

Standardization: Aims

- **minimize individual differences within study populations**
(within-experiment variation)
 - maximize test sensitivity (reduction of sample size!)
- **minimize differences between study populations**
(between-experiment variation)
 - maximize reproducibility of results

Effects of the environment on animal phenotype: Two questions.



Ethical question:

- Implications for the animals?
→ animal welfare

Scientific question:

- Implications for the research?
→ scientific validity

Stereotypic behaviour

Cage-induced abnormal behaviours: Stereotypies





Stereotypies

Definition

Repetitive, invariant behavioural pattern without obvious goal or function

Causation

Frustration of essential behavioural needs

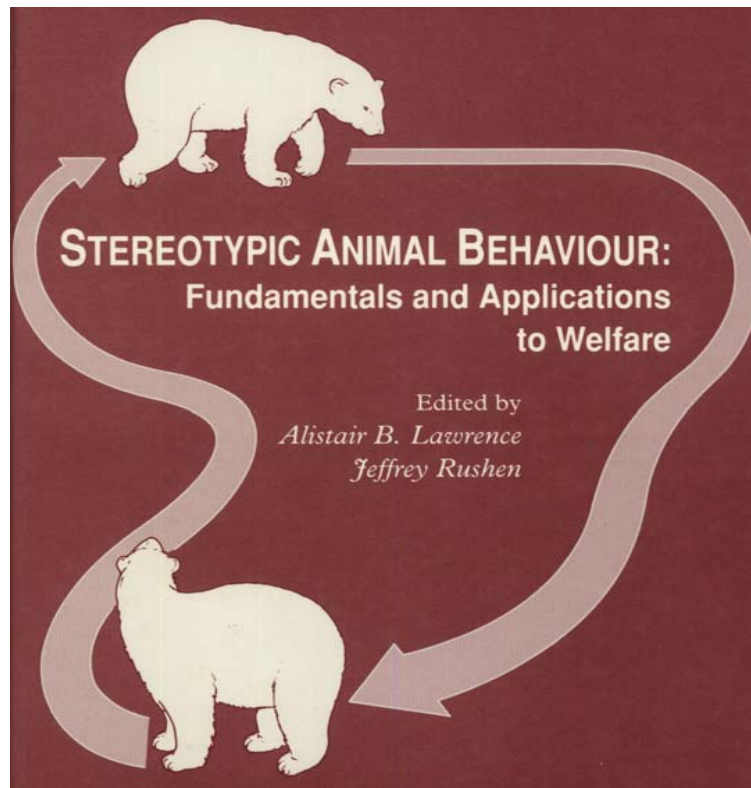
Consequences?

Polar Bear at Zürich Zoo

Foto: H. Hediger

Stereotipie

Comportamenti relativamente invariati e ripetitivi, apparentemente privi di funzione nel contesto in cui vengono espressi (Mason, 1991)



“Le stereotipie possono rappresentare un chiaro sintomo di stress e una strategia di “adattamento” allo stimolo stressante...”

Lawrence A.B. and Rushen J. 1993. Stereotypic animal behaviour: Fundamentals and applications to welfare. CAB International, pp. 212

Stereotypic behaviour

- Stereotypies develop from behavioural responses to the frustration of essential behavioural needs
- Stereotypies reflect the disruption of neural mechanisms involved in the inhibitory control of behaviour
- Stereotypies are pathological consequences of inappropriate housing conditions
- Current standard housing conditions for laboratory mice seem inappropriate

Stereotypic behaviour



Stereotypies in humans:

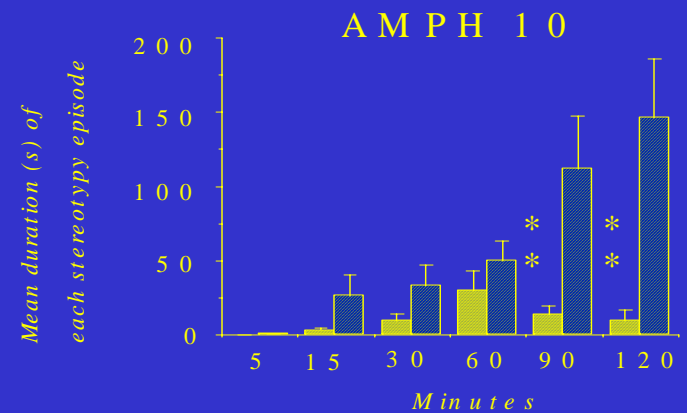
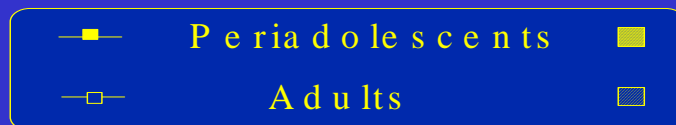
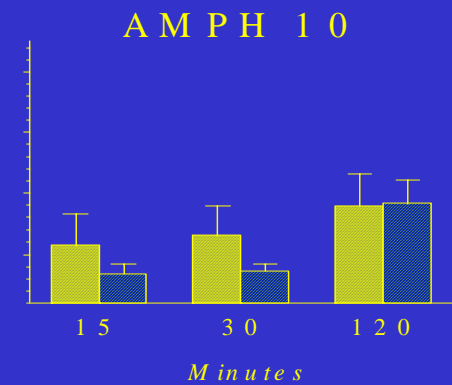
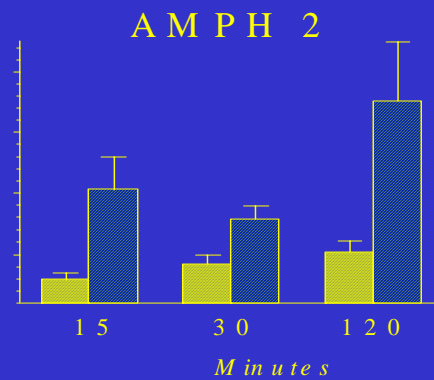
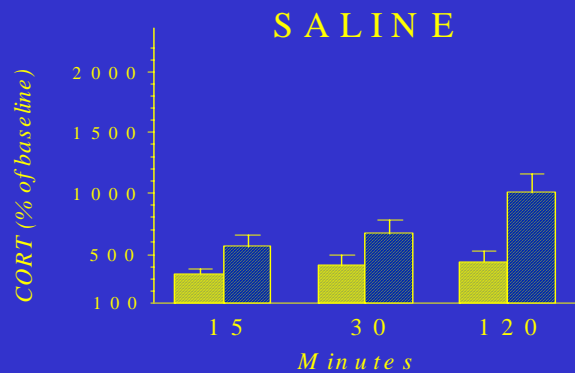
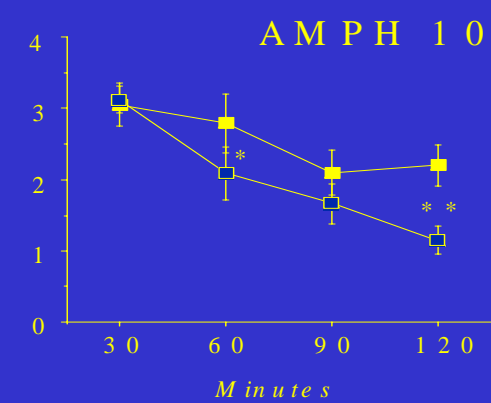
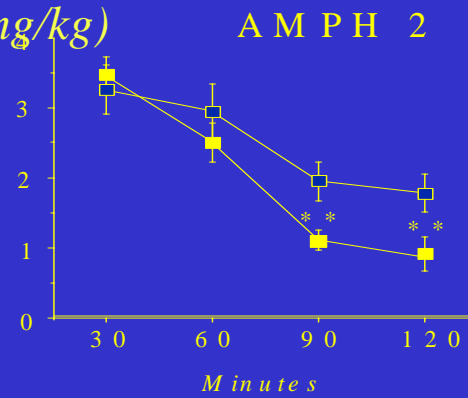
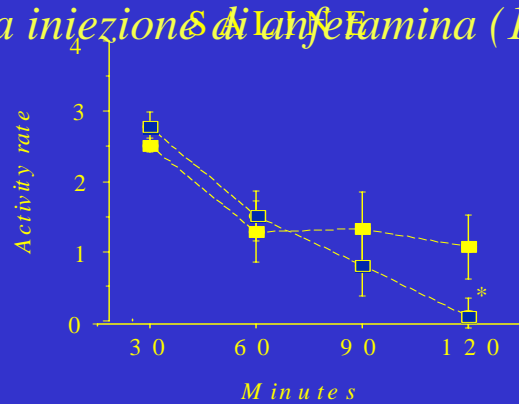
Symptom for psychiatric disorders
e.g. schizophrenia, autism

Symptom for lesions and disorders of specific
brain regions (basal ganglia)

RELAZIONE TRA LIVELLI DI PLASMATICI DI CORTICOSTERONE E **ESPRESSIONE DI STEREOTIPIE COMPORTAMENTALI**

risposta a iniezioni di Anfetamina (10 mg/kg)

in



STUDY

- The experience of stressful events in early life can turn to an increased predisposition to mood disorders at adulthood. Several data indicate in prenatally stressed rats increased anxiety and emotionality.

- The capacity of a precocious environmental intervention to normalize the behavioural and immunological dysfunctions produced by a stressed pregnancy was investigated. In order to assess new therapeutic strategies, an environmental enrichment approach was used.

- Pregnant rats underwent three-45 min/day sessions of prenatal restraint stress (PS) on gestation days 11 to 21, and offspring were assigned to either enriched-environment or standard living cages throughout adolescence (pnd 22-43).

Prenatal Stress and depression: Therapeutic approach by means of environmental stimulation

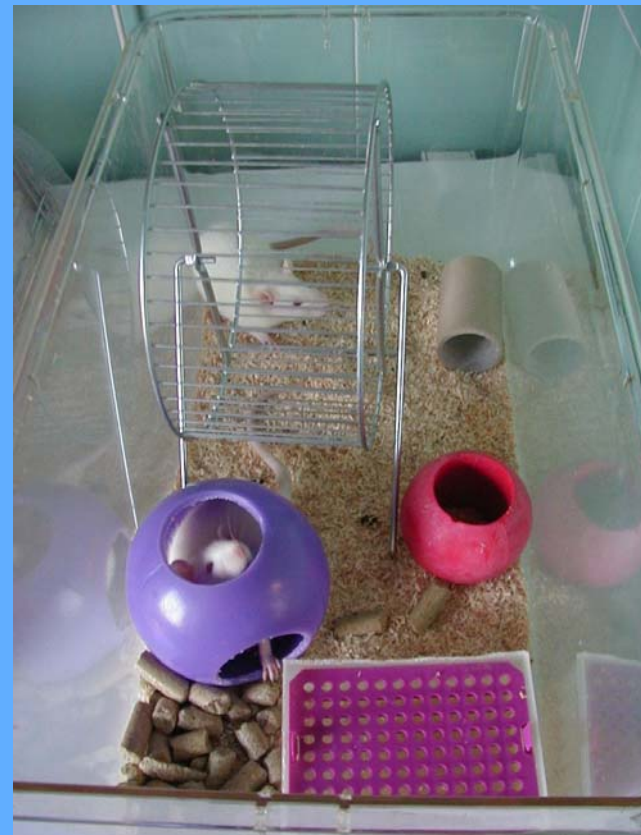


Non-enriched environment



↑
(2 rats per cage) →

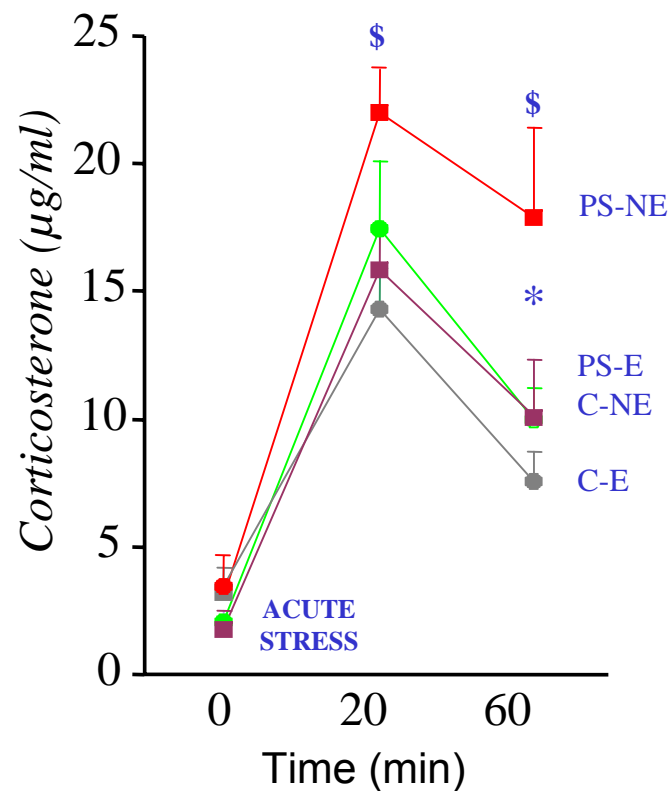
Enriched environment



Gabbia standard

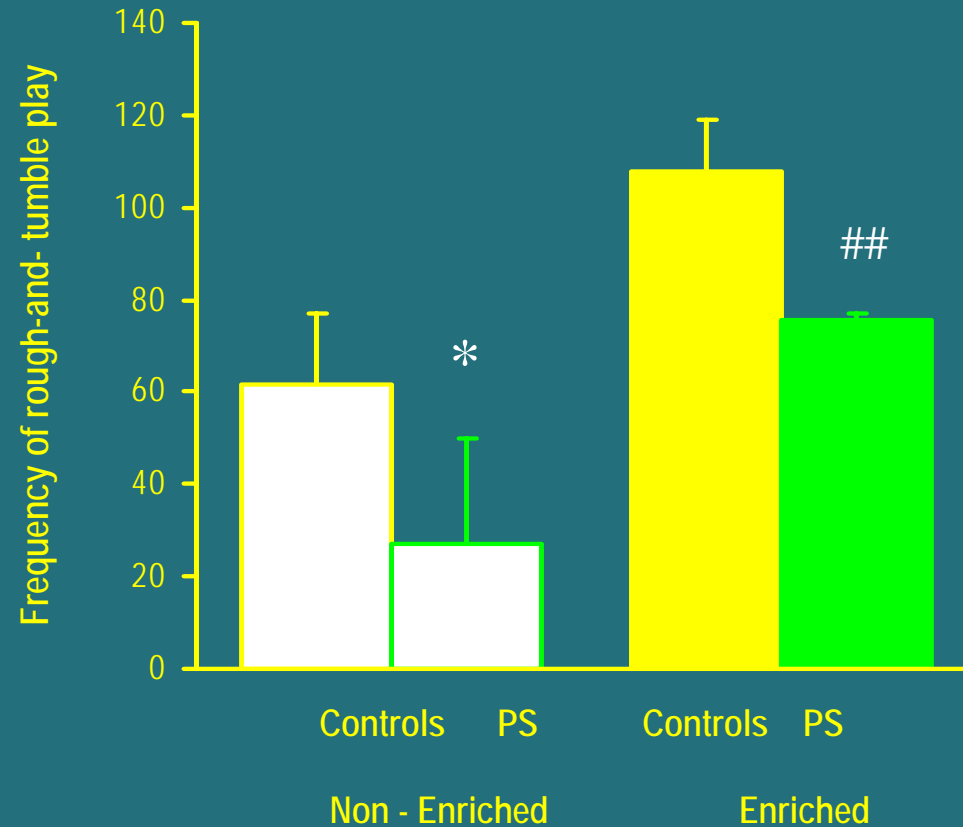


Ambiente arricchito



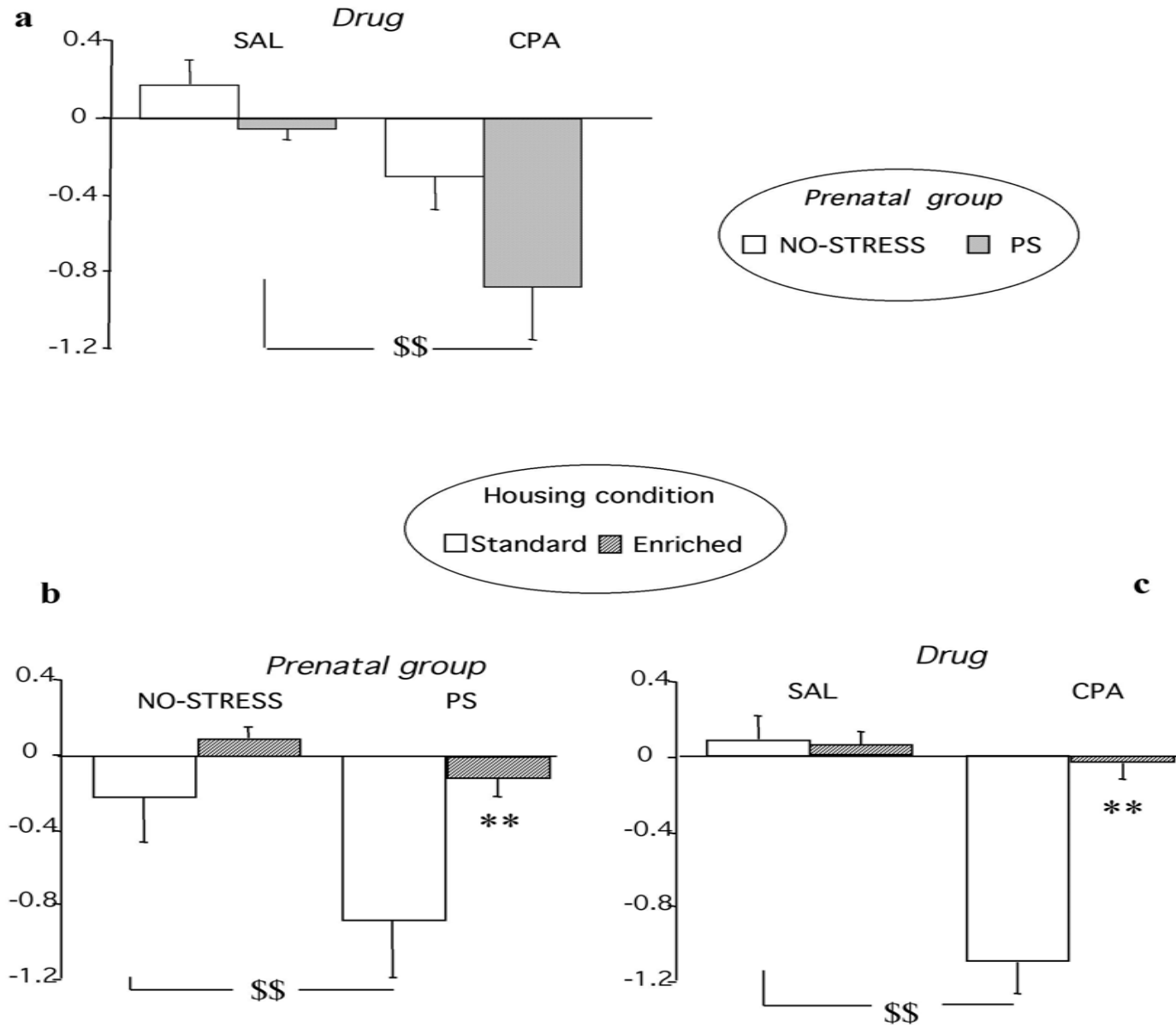
Nel nostro modello (ratti sottoposti a stress prenatale, **in rosso**), la possibilità di interagire durante l'adolescenza con un ambiente arricchito (**in verde**) ha prodotto una significativa normalizzazione della risposta neuro-endocrina a uno stress acuto (**vedi figura**) e del repertorio comportamentale (stati d'ansia, interazioni sociali).

Environmental enrichment and social play behaviour



Environmental enrichment reverses the reduction of play behaviour induced by Prenatal Stress

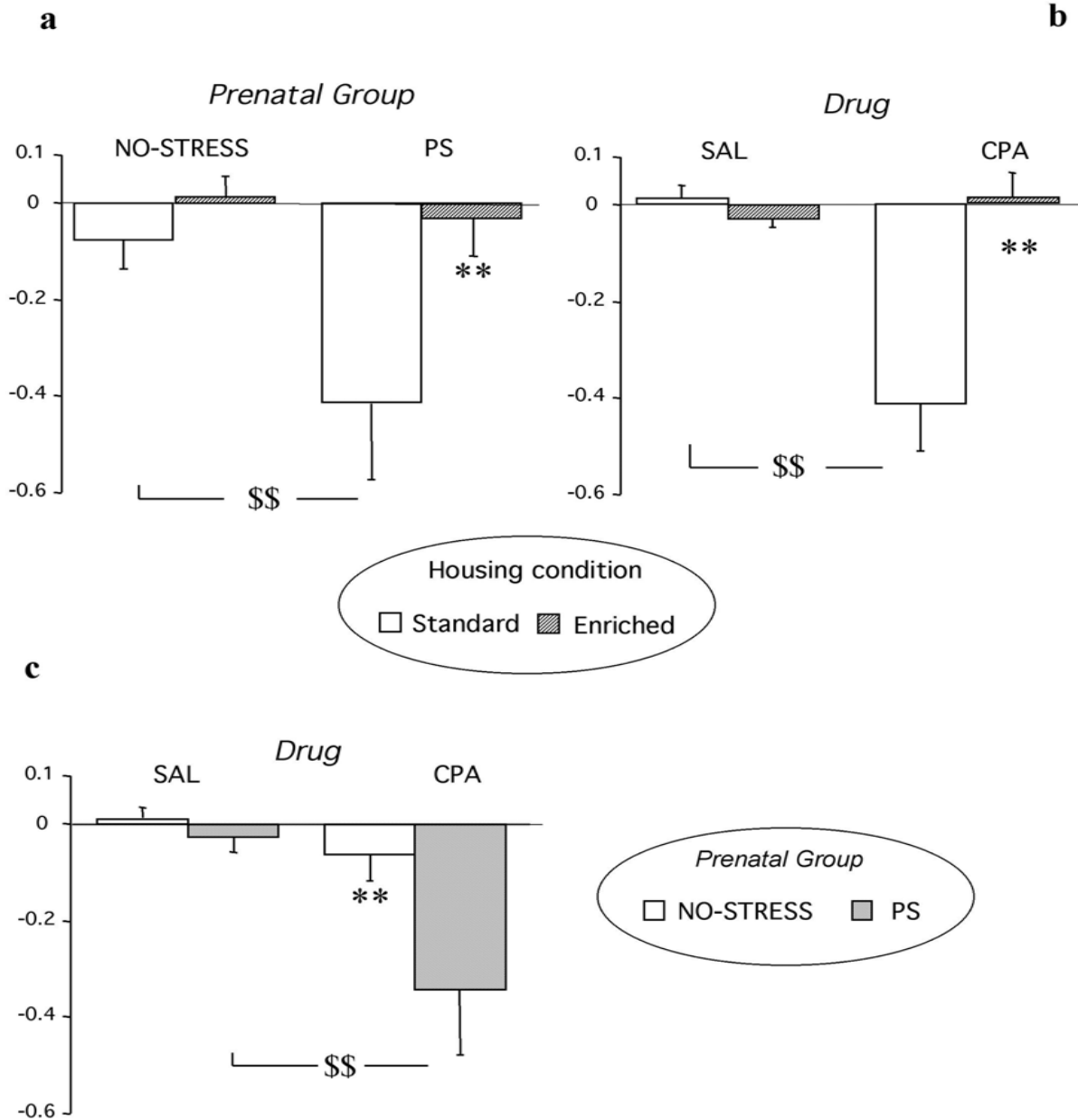
CD 4 T-cells



STATISTICAL RESULTS :

- **GROUP** **
- **GROUP x COND** *
- **DRUG** *
- **GROUP x DRUG** *
- **COND x DRUG** *

T4/T8 ratio



STATISTICAL RESULTS :

- **GROUP x COND** *
- **DRUG** *
- **GROUP x DRUG** **
- **COND x DRUG** **

-GROUP *

-COND **

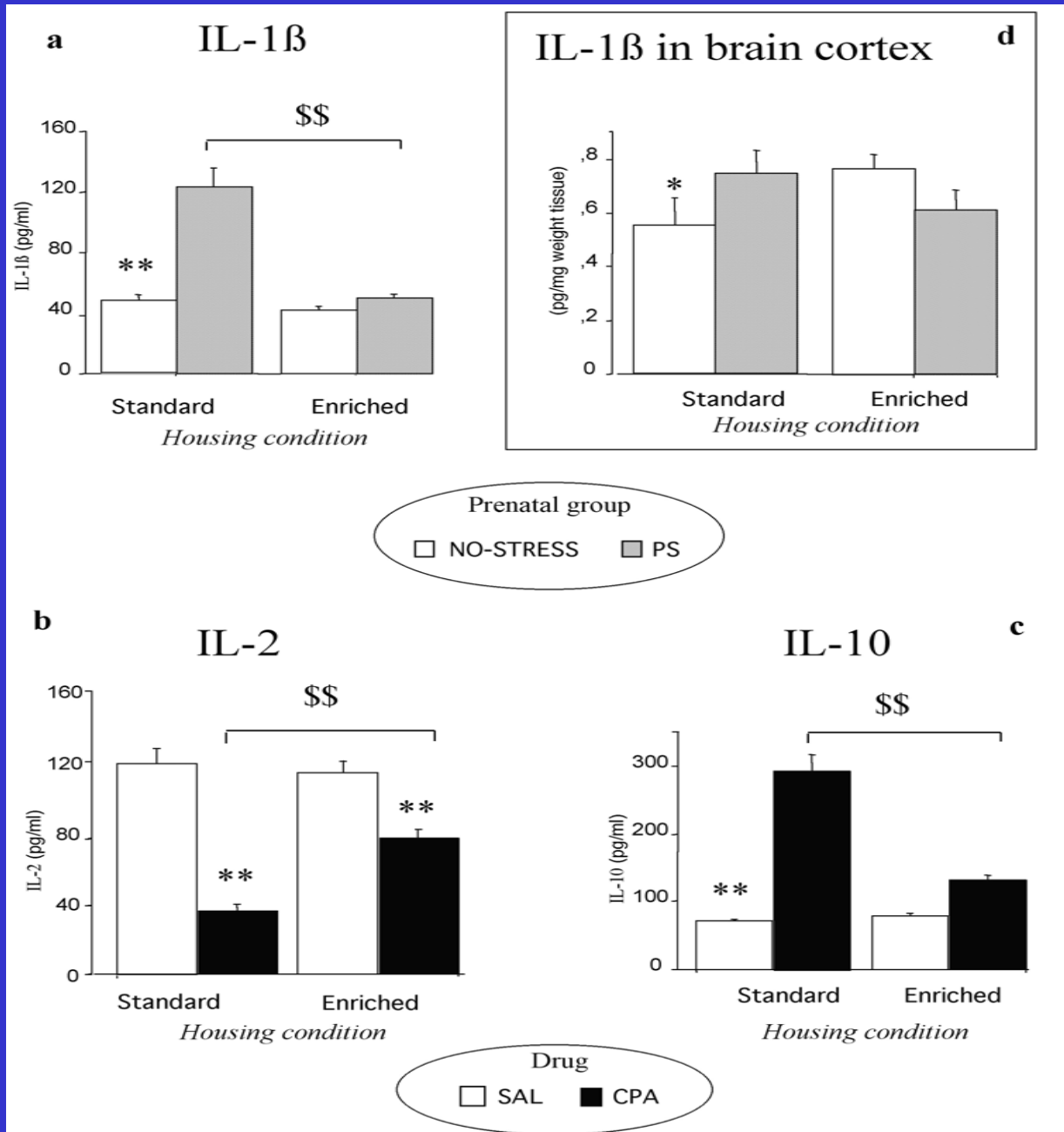
-GROUP x COND **

-DRUG *ns*

-COND **

-DRUG **

-COND x DRUG **



- GROUP x COND *

- COND x DRUG **

- for hypothalamus: COND *

STATISTICAL RESULTS :

- COND *

- DRUG *



VI RINGRAZIAMO PER L'ATTENZIONE