

Use of stress hormone analyses in hair

for diagnosis and stress management

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There are different stress hormone (cortisol) biomarkers.

Table 1 A comparison of properties of the various matrices for cortisol measurement.

Property	Serum	Saliva	Urine	Hair
Subjective level of invasiveness associated with sample collection	High	Low	Moderate	Low
Cortisol affected by stress of sampling procedure?	Possibly	Possibly	Possibly	No
Storage requirements	Spinning and refrigeration followed by freezing	Refrigeration or freezing	Refrigeration or freezing	Room temperature; stable for years
Time periods of cortisol production represented	Single point measure	Single point measure	12–24 h; integral of exposure	Months to years; integral of exposure
Affected by changes in cortisol binding globulin?	Yes; total cortisol measured	No; only free cortisol measured	No; only free cortisol measured	No; only free cortisol measured
Clinically relevant reference ranges established?	Yes	Yes	Yes	No

Proposed cortisol incorporation into hair.

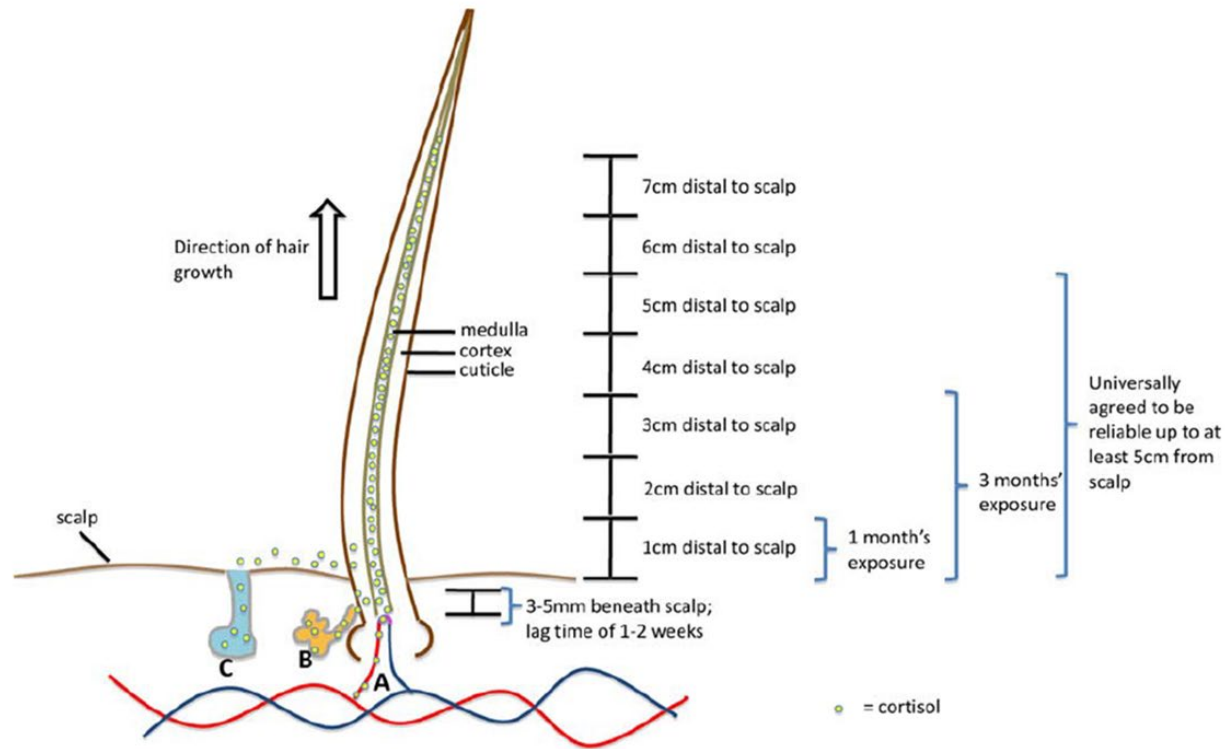


Figure 1 Proposed mechanisms for incorporation of cortisol into hair via blood (A), sebum (B), and sweat (C).

Russell, 2012

The advantages of hair cortisol measurements.

1. Non-invasive procedure.
2. No problems with storage of samples.
3. Uses well-developed and standardized cortisol assays (saliva).
4. No problem with stress during sampling.
5. Can be used to determine chronic stress levels.
6. Can be used to track stressful periods in the patients / clients life.
7. Can be used in both humans and animals.

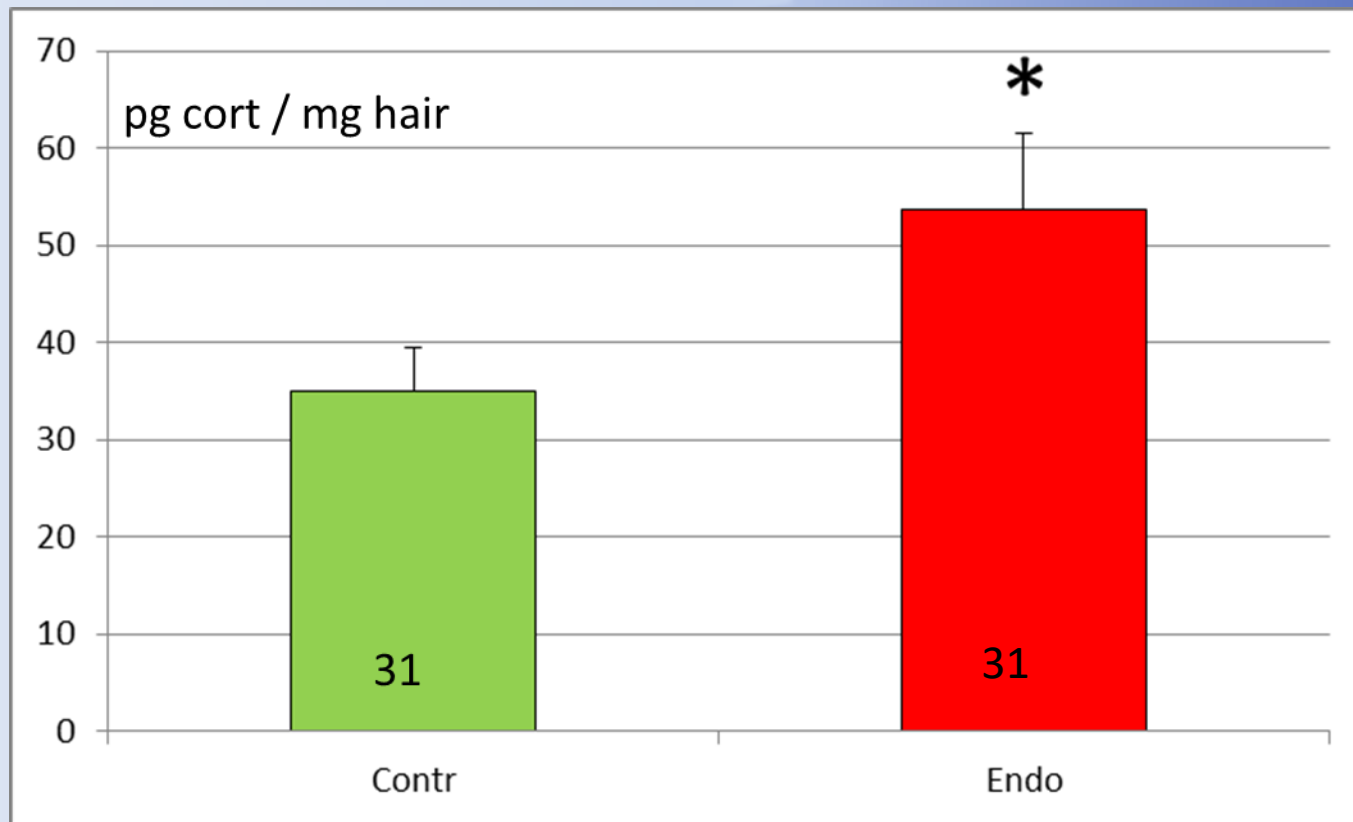
Critical issues

1. Extraction procedure.
2. Determination of reference ranges.
3. Standardization of procedures.

The background of the slide features a blue gradient with a white shadow of a palm tree on the right side, extending from the top right towards the bottom right.

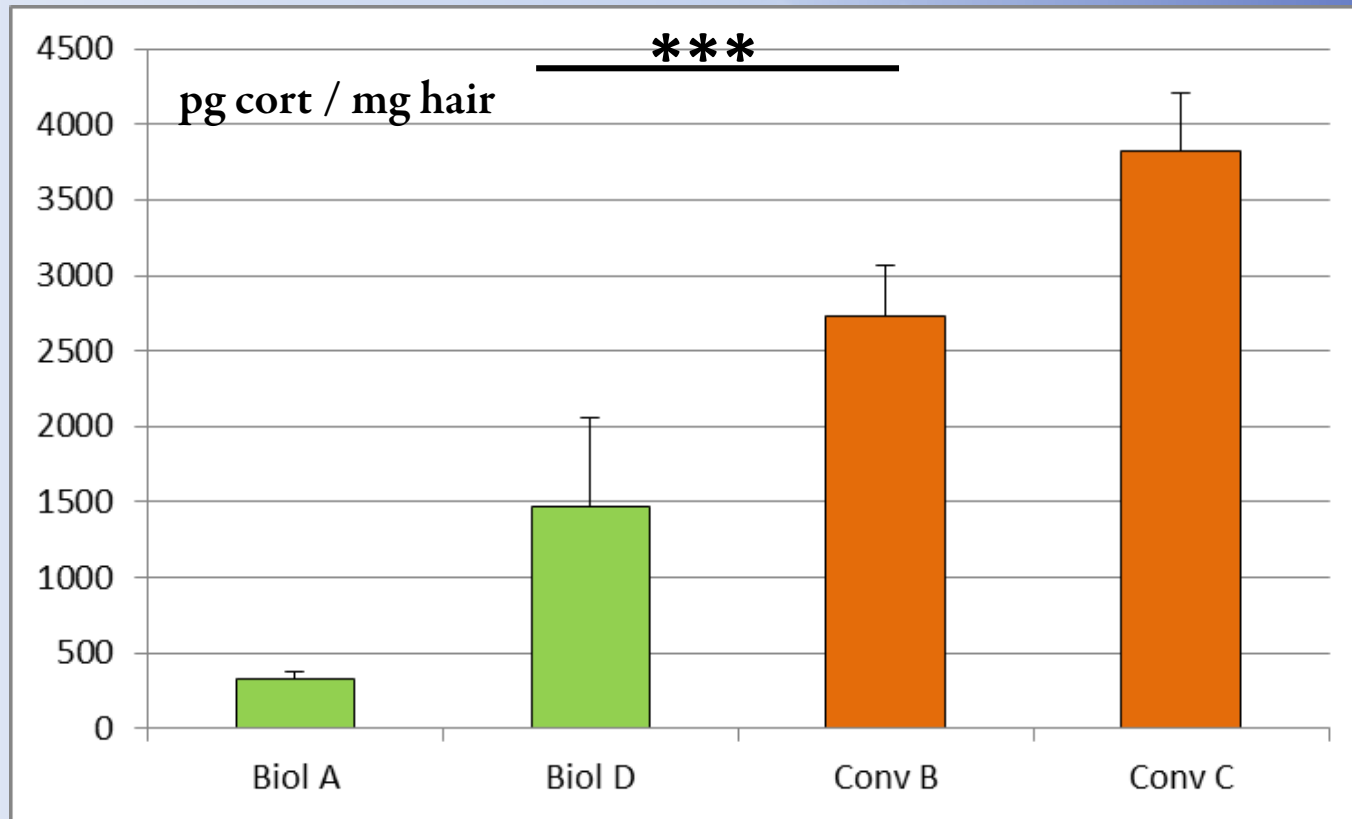
Examples of stress hormone analyses performed by Chardon Pharma.

Women with endometriosis are chronically stressed.

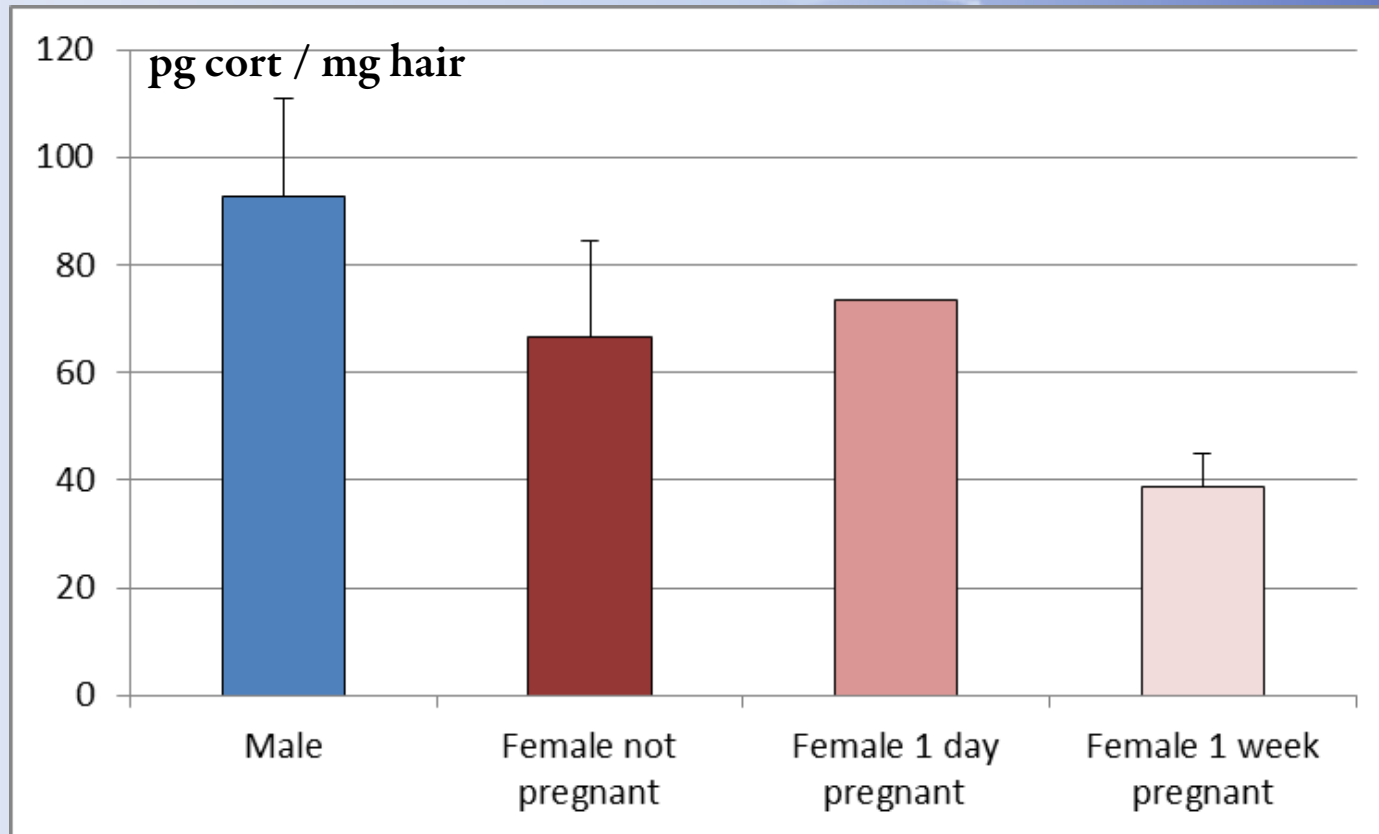


Van Aken et al., 2018

Conventional housing of pigs is more stressful than biological housing.



Pregnant rabbits have low corticosterone levels.



Homozygous *Ndufs4*^{def} mice have increased hair corticosterone levels.

