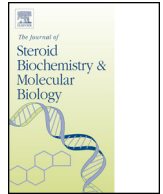




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## Comparative analysis of intraluteal steroidogenic enzymes emphasises the functionality of fresh and persistent *corpora lutea* during pro– and metoestrus in the *lynx*



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## ABSTRACT

European *lynx* species demonstrate an atypical ovarian cycle compared to other felids. The physiological persistence of *corpora lutea* (CLs), reflected in constantly elevated progesterone (P4) concentrations in serum, is thought to ensure a seasonal monoestrus. Moreover, the coexistence of CLs from a recent ovulation (freshCLs) and persistent CLs from previous years (perCLs) on the same ovary has been proven. We assume that perCLs in *lynxes* occur due to fundamentally different mechanisms of luteal regression. Our study presents a detailed analysis of steroidogenic enzymes and steroids in fresh and perCLs obtained from *Iberian lynxes* during metoestrus, and in perCLs obtained from *Eurasian lynxes* during prooestrus. By quantitative PCR we measured relative mRNA amounts of steroidogenic acute regulatory protein (*STAR*), cytochrome P450 oxidases (*CYPs*), hydroxysteroid dehydrogenases (*HSDs*) and a steroid reductase (*SRD*). Protein expression in CLs was investigated for *CYP11A1*, *CYP17A1*, *CYP19A1* and *HSD3B*. Additionally, the intraluteal and serum steroid content was determined. During metoestrus, mRNA amounts of *STAR*, *CYP11A1*, *CYP19A1*, *HSD17B7* and *SRD5A1* were significantly higher in perCLs compared to freshCLs. Protein of *CYP11A1* was detected independently of the CL age in metoestrus, but expression was less evident in prooestrous perCLs. The protein signal of *CYP17A1* was strong in freshCLs and perCLs of metoestrus, but weak at prooestrus. The presence of *CYP19A1* protein was confirmed in each stage of the CL. These findings contribute to the hypothesis that CLs from previous years might support freshly developed CLs for pregnancy maintenance. However, initiation of ovulation might require a functional down-regulation of perCLs prior to breeding. It is noteworthy that the *HSD3B1* mRNA amount was significantly elevated in fresh compared to perCLs (metoestrus). Accordingly, *HSD3B* protein was substantially present in freshCLs, whereas signals were literally absent in all perCLs. Elevated expression of *HSD3B* coincided with high intraluteal oestrogen concentrations in freshCLs; however, the enzyme pattern was less concordant with intraluteal P4 and androgen concentrations. Serum P4 concentrations of *Iberian lynxes* were constant between prooestrus and prolonged dioestrus. Moreover, constantly high serum oestrogen concentrations were measured during pro-, met- and prolonged dioestrus. The physiology of exceptionally high serum oestrogen concentrations outside the breeding season of *lynxes* merits further investigation. In conclusion our study supports the concept that the unique reproductive strategy of *lynxes* is directly linked to sustained intraluteal steroid biogenesis in persistent CLs.

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**Abbreviations:** CL, corpus luteum; CYP, cytochrome P450 oxidase; EL, *Eurasian lynx*; freshCL, freshly formed CL; HSD, hydroxysteroid dehydrogenase; IL, *Iberian lynx*; P4, progesterone; perCL, persistent CL; SRD, steroid reductase; STAR, steroidogenic acute regulatory protein.

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