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Prostaglandins—A Promising Future

by

Jeaneyl Hazlett*

Prostaglandins were discovered almost forty years ago, but their elucidation physiologically is in its infancy today. It was only in 1957 that the first prostaglandin, PGF$_1$-alpha, was crystallized from sheep seminal vesicles. By 1966, all of the known fourteen natural prostaglandins had been synthesized from commercially available materials. Research data has been compiled at a remarkable rate during the last three to five years.

Prostaglandins are unsaturated 20-carbon fatty acids whose varying structural differences determine their action on smooth muscle and blood pressure. There are four main types labeled A, B, E, and F; and E and F types are considered primary as they are produced directly from fatty acid precursors in cell microsomes. PGA$_1$, PGA$_2$, PGE$_1$, and PGE$_2$-alpha are currently being investigated the most because of their pharmacological activity. PGF$_2$-alpha and PGE$_2$ are being used clinically in Europe and are under test in the United States.

Exactly how all prostaglandins function in the body is not known, but they can be found in all tissues of the body. Possibly they are related to the cyclic AMP pathways (cyclic adenosine 3,5'-monophosphate) affecting the amount formed, acting as a hormone, or a relay for a hormone. Although physiologically prostaglandins have not been explained, many of their pharmacological effects have been investigated in both man and animals, especially their action on smooth muscle.

PGF$_2$-alpha is produced by the uterus and is believed to be a luteolytic hormone which terminates the life of the corpus luteum in ovine, bovine, porcine and equine species. In the ovine, bovine, and porcine the uterine luteolysin passes to the ovary thru a local pathway. Likewise, when intrauterine PGF$_2$-alpha is used it must be placed in the uterine horn ipsilateral to the ovary containing the active corpus luteum. Allen and Rowson report that in cattle when PGF$_2$-alpha is infused into the uterus on two successive days between day 5-16 of the cycle (day O-ovulation), it induces estrus three days later. Tervit, Rowson, and Brand report equal success with PGF$_2$-alpha analogue (ICI-79939), by increasing the I.U. dose and giving it I.M., making it more practical to use.

Due to their luteolytic activity as reported by E. K. Inskeep, prostaglandins can be used effectively as abortifacients and parturition inducers in cattle and pigs. Studies in man have shown advantages over the use of oxytocin which can produce tetanic contraction. Possibly in the future prostaglandins could be used to terminate a near parturition calf of supersire breeding to prevent dystocia problems commonly seen in some Holsteins and exotic breeds.

The mare is a different story. A unilateral hysterectomy prolongs the life of the corpus luteum in some mares, but not in others. The ratio in which maintenance occurs is similar with no relationship to whether the CL is contralateral or ipsilateral to the remaining horn, suggesting that the luteolysin reaches the ovaries thru the blood vascular system.

The estrous cycle of the mare is twenty-two days with a variable estrus of three to ten days. Ovulation occurs twenty-four to forty-eight hours before the end of estrus. Allen and Rowson have shown that using a potent analogue of PGF$_2$-alpha

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they could shorten the dioestrual period of mares. An I. U. or I. M. injection of 230 ugm given during the fourth to thirteenth day of dioestrus for two days brought the mares into estrus in three days, and ovulation occurred in seven to twelve days peaking at ten days. If given before three days old, the CL is not susceptible.

There are many clinical possibilities for the use of prostaglandins in the mare. Using prostaglandins, one could control and shorten the cycle of the mare by decreasing the time spent in dioestrus. They could be of particular importance on the breeding farm where many mares are booked to one stallion so that the estrus periods could be planned to prevent concurrent estrus periods. Where A. I. is practiced prostaglandins would prove invaluable. In Thoroughbred mares whose breeding season is restricted and A. I. not allowed by the breed registration authorities prostaglandins could shorten estral cycles from 22 to 14 days,3 thus increasing the number of possible cycles per season. As a final touch, they provide a means of treating the “problem mare” with a persistent CL which prevents normal cycling. This category could include early abortion, resorption, barren or lactating mares.

Although the main emphasis in research has been on reproduction, prostaglandins show promise in various other areas of research relating to man and animals.1

**References**


**Drug Interactions**

by

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Rapid advances in research in basic pharmacology and the productivity of the pharmaceutical industry have resulted in the introduction of many new drugs for the veterinary profession. The availability of large numbers of drugs has stimulated their concomitant use with the hope that maximum therapeutic effectiveness will be achieved. Indeed modern therapeutics in veterinary medicine often necessitates the simultaneous administration of several

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