Journal of Animal and Veterinary Advances 4 (8): 716-718, 2005

Sixty Years of the Ram Effect (1944-2004): How Have We Learned What We Know About It

Rodolfo Ungerfeld
Departamento de Fisiología, Facultad de Veterinaria, Lasplaces 1550, Montevideo 11600, Uruguay

Abstract: The aim of this study was to summarize the information related to the development of the scientific knowledge about the ram effect. Articles covering the topic were searched in several scientific databases and the origin of the authors, the year of publication, the journal in which the article was published, the number of authors and the sheep breed used was registered. Overall, 154 articles were obtained, most of which (43%) were published by Australian and New Zealand authors. The trend of the articles published outside Australia and New Zealand parallels the changes in the total number of sheep. Merino, Romney and Corriedale sheep were used in more than 50% of the articles. The general overview is that while in Australia and New Zealand the research has been developed during the eighties independently of the conjunctural needs, in the rest of the world depended more on market conditions.

Key words: Ram effect, research trends, sheep, ovine

INTRODUCTION

The reproductive effects of the introduction of rams to previously isolated anestrous ewes (the ram effect) have been known since 1944[1]. However, as early as 1813, the existence of a reproductive stimulus from consequence of the introduction of rams to ewes has been suggested[2]. As a consequence of the stimulus provoked by joining ewes with rams, part of the flock may ovulate, come into estrus and result pregnant. The physiological mechanisms underlying this response have been widely studied, probably because it may be a useful and suitable tool for out of season estrous induction, considering its negligible cost and the no need of hormonal use[3-5].

Scaramazzi[6] proposed that countries in which export earnings depend heavily on primary industry, the main research strategy should be to improve the efficiency of production with an emphasis on increased intensification and sophistication, including a greater control over the quality of the end product and a greater ability to respond rapidly to the demands of the market. Both, the discovery of th e ram effect and its practical implementation were considered by Scaramazzi[6] part of the major advances in research of sheep reproduction, which may be used according to the former idea. However, external influences on reproduction including social cues- are still an untapped resource, needing more profound study[7] . The control of the breeding period of ewes –which may be managed using the ram effect- is one of the most important topics of research on animal production in Latin America[5,8].

Since the publication by Underwood *et al.*[1] several studies about the ram effect have been performed. Reviews updating the information on the biology of the ram effect have been published through the last decades[3,5,9-11]. This article presents a new approach to the topic, analyzing how the ram effect has been studied, including an examination of the evolution of the number of articles and number of authors/article, country of origin of the article and breeds used for the studies.

MATERIAL AND METHODS

Bibliographic searches were performed in agricola, agris, BIOSIS previews and CAB abstracts. The terms used were ram effect, ram and introduc, teaser and sheep, sheep and pheromon. All the citations obtained were filtered, letting only those directly related to the ram effect. The reference list of each article was searched to find more publications about the ram effect. The same was performed in the new papers located.

The country of affiliation of the first author the number of authors and the breed of sheep used in the experiments were registered. Only papers published in international peer-reviewed journals were considered for the analysis; reviews, book chapters, thesis and abstracts from proceedings were not included. Due to the important amount of information published there, the proceedings from the Australian and New Zealand Societies of Animal Production were included in the analysis. If more than three articles included at least one

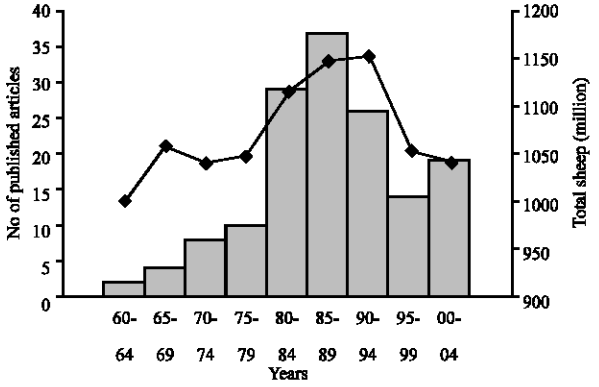

Fig.1: No. of articles published about the ram effect in international journals (vertical bars) and total number of sheep in the world (-◆-)

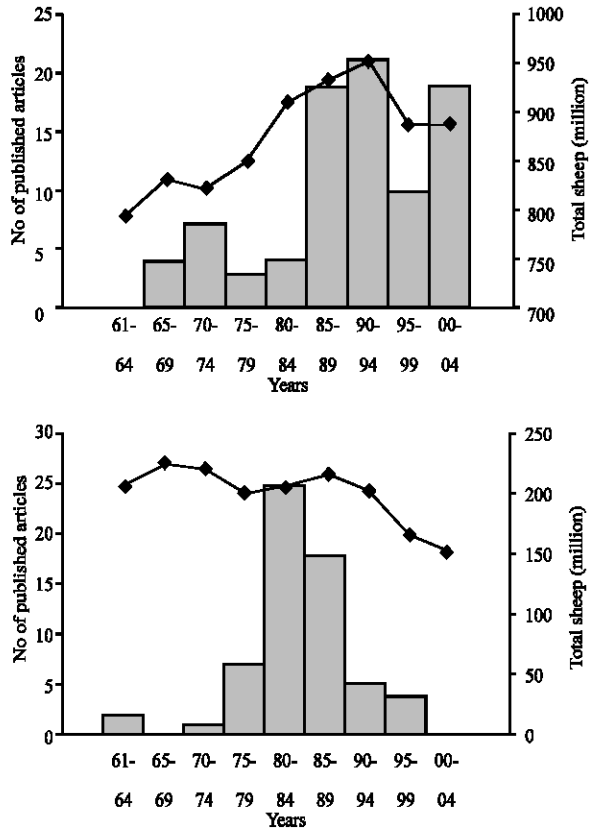

Fig. 2: No. of articles published about the ram effect in international journals (vertical bars) and total number of sheep in the world (-◆-). Data correspond to: A) World not including Australia and New Zealand; B) Australia and New Zealand.

main author in common it was considered a group that performed research in the topic. The number of sheep was searched in FAO [3] databases.

Table 1: Number (%) of articles published according to the affiliation of the first author

	Ram effect	Theriogenology[14]	ICAR[13]	Behaviour[15], †††
Oceania	66 (42.9)	66 (4.6)	26 (2.6) ††	49 (24.6)
Europe	38 (24.7)	324 (22.7)	449 (47.6)	79 (39.7)
Africa	18 (11.7)	54 (3.8)	81 (8.6)	1 (0.5)
USA	14 (9.1)	802 (56.2) †	202 (21.4)	70 (35.2)
Canada				
Latin America	11 (7.1)	30 (2.1)	92 (9.7)	0 (0)
Asia	7 (4.5)	150 (10.5)		1 (0.5)
Total	154	1426	944	199

† USA papers were calculated from total papers minus papers originated outside USA†† Australia and Asia were presented together, as Australasia, so this value corresponds to Oceania and Asia together ††† One article originated in Jamaica is not included

RESULTS AND DISCUSSION

A total of 154 articles published in 43 different journals were included in the study. The total number of articles published per lustre (Fig. 1). Since the first article published[1], scientific interest in the subject steadily increased until the 1980s, when most reports were published. The number of papers per year parallels the world population of sheep (Fig. 1), with a decrease in the beginning of the 1990s. This suggests that study on the ram effect has been closely related to production interests and industry funding. However, if articles are disaggregated according to country of origin (Oceania, or rest of the world(Fig. 2), this relationship is not confirmed for Oceania, from where most articles have been published. A possible explanation is that in Australia and New Zealand, not only the conjunctural market conditions determined the research priorities, considering also the development of techniques and managements that allowed productive systems to respond rapidly to market changes. A second explanation is that articles published in the Proceedings of the Australian and New Zealand Societies of Animal Production were included, increasing the number of publications from that origin.

Australian and New Zealand authors published sixty-six articles (42.9%). The regions of origin of the articles are presented in Table 1. The distribution of the origin of the articles differ from that observed in studies of publications of general animal reproduction topics[13,14] or another issue related to the ram effect, such as behaviour[15] (Table 1). Confirming previous suggestion, the importance that the research on the ram effect received in Australia-New Zealand should be more a consequence of specific orientations of research, than of general support of research in animal reproduction.

Considering also local and regional publications, at least 52 pure-breeds have been used in articles about the ram effect. Particularly, Merino and Romney Marsh breeds were used in more than 40% of the articles published in international journals (41.7%). If the third breed (Corriedale) is included, those 3 were used in more

Table 2: Number of authors (Mean±SEM) in articles about the ram effect published in international journals

Years	n	No of authors/paper
1950-1959	4	1.3±0.3[a]
1960-1969	6	1.8±0.2[ab]
1970-1979	18	2.3±0.2[b]
1980-1989	66	3.0±0.2[c]
1990-1999	40	3.7±0.25[d]
2000-2004	17	4.3±0.4[d]

than 50% of the articles (51.3%). The other breeds were used in 0.8 to 3.0% of the articles. The Merino and Romney breeds are the predominant breeds in the countries from which more publications came from (Australia and New Zealand). The high incidence of the Corriedale breed is mainly provoked by the fact that in all the articles published from Argentina and Uruguay Corriedale ewes were used. In contrast, in the articles from European and North American a widespread variety of breeds were used.

Research groups working in this topic were identified in Argentina, Australia, France, New Zealand, South Africa, Spain, United Kingdom, USA and Uruguay. If local publications and abstracts are included (not included in the Figures) research groups can be also identified in Chile, Greece, Ireland, Mexico and Turkey. Overall, articles had 3.16±0.11 authors. The number of authors per article increased significantly through the decades ($p<0.001$; Table 2), which coincides with the general scientific trend[16,17].

CONCLUSIONS

The recent increase in the sheep population in undeveloped countries [12] demands the increase in knowledge of the mechanisms that control reproduction and the use of scientific information in applied productive managements. The ram effect, as a cheap and easy technique, may be included in applied managements allowing farmers to obtain out-of-season lambing, to advance puberty onset, or to develop accelerated reproductive programs. Although more than 70% of sheep are in Latin America, Africa and Asia, only 33% of the information was obtained in countries from these continents. Little is still known about the possible differences in the response of the predominant breeds of underdeveloped countries. Thus, more study should be done to understand how to obtain the maximum response of ewes to the ram effect.

REFERENCES

1. Underwood, E.J., F. L. Shier and N. Davenport. 1944. Studies in sheep husbandry in W.A.V. The breeding season of Merino, crossbreed and British Breeds ewes in the agricultural districts. J. Agric. W.A., 11: 135-143.
2. Girard, L., 1813. Moyens employés avec succès, par M. Morel de Vindé, membre de la Societé d'Agriculture de Seine et Oise, pour obtenir, dans le temps le plus court possible, la fécondation du plus grand nombre des brebis d'un troupeau. Ephémérides de la Societé d'Agriculture du Département de l'Indre pour l'An 1813, Séance du 5 Septembre, VIII Cahier, Château-Roux, Département de l'Indre, VII: 66-68.
3. Martin, G.B., C.M. Oldham, Y. Cognié and D.T. Pearce, 1986. The physiological responses of anovulatory ewes to the introduction of rams. A review. Livest. Prod. Sci., 15: 219-247.
4. Thimonier, J., Y. Cognie, N. Lassoued and G. Khaldi, 2000. L'effet mâle chez les ovins: Une technique actuelle de maîtrise de la reproduction. INRA Prod. Anim., 13: 223-231.
5. Ungerfeld, R., M. Forsberg and E. Rubianes, 2004. An overview of the response of anoestrous ewes to the ram effect. Reprod. Dev. Fertil., 16: 479-480.
6. Scaramuzzi, R.J., 1988. Reproduction research in perspective. Proc. Aust. Soc. Anim. Prod., 17: 57-73.
7. Martin, G.B., 1995. Reproductive research on farm animals for Australia some long-distance goals. Reprod. Fertil. Dev., 7: 967-982.
8. Rubianes, E and R. Ungerfeld, 2002. Perspective of research on ovine reproduction in Latin America within the framework of the present productive tendencies. Arch. Latinoam. Prod. Anim., 10: 135-143.
9. Knight, T.W., 1983. Ram induced stimulation of ovarian and oestrous activity in anoestrous ewes: A review. Proc. New Zeal. Soc. Anim. Prod., 43: 7-11.
10. Walkden-Brown, S.W., G. B. Martin and B. J. Restall, 1999. Role of male-female interaction in regulating reproduction in sheep and goats. J. Reprod. Fertil. Suppl., 52: 243-257.
11. Rosa, H. J. D and M. J. Bryant, 2002. The ram effect as a way of modifying the reproductive activity in the ewe. Small Rum. Res., 45: 1–16.
12. FAO, 2004. http://apps.fao.org [consulted 19 September 2004].
13. Mirande, A., J.M. Russel, C.S, Galina and R. Navarro-Fierro, 1987.Research in animal reproduction: An analysis of the contribution made by Latin America. Theriogenology, 28: 121-127.
14. Shille, V.M. and E. Cech, 1990. A decade of publishing theriogenology. Theriogenology, 34: 1-6.
15. Alexander, G., 1982. Applied animal ethology: Survey of first twenty-five issues. Applied Anim. Ethol., 8: 391-399.
16. Fletcher, R.H. and S.W. Fletcher, 1979. Clinical research in general medical journals. A 30-year perspective. N. Engl. J. Med., 301:180-183.
17. Burman,K.D., 1982. Hanging from the masthead: Reflections on authorship. Ann. Intl. Med., 97: 602-605.