Atypical dermatophilosis of sheep in Kenya

J K Wabacha[a*], C M Mulei[a], N P Gitonga[a], M J Njenga[a], A G Thaiyah[a] and J Nduhiu[a]

ABSTRACT

An outbreak of an atypical form of ovine dermatophilosis affecting the lips and muzzle with a very high morbidity in weaners and hoggets in Kenya is reported. Clinical diagnosis of ovine dermatophilosis was made and confirmed by direct microscopic examination as well as isolation and identification of *Dermatophilus congolensis* from scab material from the affected sheep. The morbidity rate within the flock was 31.8 % (237/745) with 98.3 % (233/237) of the affected sheep being weaners and hoggets. No fatalities were recorded. The lesions, confined in the lips and the muzzle, were swelling of both the upper and lower lips, circumscribed lumps in the skin of both the upper and lower lips, oedema of the head and the submandibular area and scabs and crusts on the lips and muzzle. Within 1 week following treatment with long acting oxytetracycline (20 %) at a rate of 20 mg/kg body weight, intramuscularly and a topical application of oxytetracycline spray, lumps regressed in size and were covered by dark-brown scabs. Removal of the dark-brown scabs revealed erythematous areas covered with purulent material and horny erythematous projections (papillae) projecting from the surfaces. Within the 2nd week, the horny erythematous projections formed greyish scabs, which later peeled off leaving alopaecic areas around the lips. The paper highlights atypical dermatophilosis of sheep and we believe that this is the first published report of an outbreak of ovine dermatophilosis in Kenya.

Key words: atypical clinical presentation, dermatophilosis, ovine.

Wabacha J K, Mulei C M, Gitonga N P, Njenga M J, Thaiyah A G, Nduhiu J **Atypical dermatophilosis of sheep in Kenya** . *Journal of the South African Veterinary Association* (2007) 78(3): 178–181 (En.). Department of Clinical Studies, Faculty of Veterinary Medicine, University of Nairobi, PO Box 29053-00625, Nairobi, Kenya.

INTRODUCTION

Ovine dermatophilosis, commonly called 'dermo' or 'lumpy wool', is an acute or subacute, chronic exudative dermatitis of sheep of all age groups. It causes economic loss to producers through lowered production, lowered wool value, treatment costs, poor-quality skins, restriction of management options such as shearing and death in severe cases[9,14,33].

It is caused by a bacterium, *Dermatophilus congolensis,* which is pleomorphic, Gram-positive, non-acid-fast, facultative anaerobe belonging to the order Actinomycetales[10]. Two characteristic morphological forms, filamentous hyphae and motile zoospores are recognised during the life cycle of the bacterium[1]. The filamentous hyphae become transversely and longitudinally septate to form parallel rows of small coccoid zoospores, which are motile. The organism persists in dry scabs and crusts from healed lesions and can survive for several months in the lesions and transmission can occur through contact with the latently infected animals[13,18,20,29,30]. The host spectrum for *Dermatophilus congolensis* includes cattle, sheep, horses, donkeys, pigs, goats, wild animals, laboratory animals and humans[31]. The causative organism does not invade an intact skin and the disruption of the skin barrier, by continued wetting due to wet weather, thorny or spiny forage, tick and insect bites, dipping and shearing is necessary for the disease to occur[3,4,13,17,22]. The disruption of the skin integrity provides the zoospores with access to living epidermal layer resulting in serous exudation which together with epithelial debris and the mycelial form of the organism dry to form a characteristic matting of hair that progresses to scab and crust formation on the skin[15,16,27].

The lesions of ovine dermatophilosis can be localised or generalised, depending on the predisposing factor[3,4,8,23,25]. Spiny plants are associated with lesions on the lips, brisket, legs and feet and heavy rainfall and shearing are associated with lesions on the back of the sheep[3,4].

Several different forms of ovine dermatophilosis have been described[28]. In Africa ovine dermatophilosis has been reported in several countries[16,31] and it is likely to occur in many other countries where predisposing factors pertain[19]. In Kenya, there is no report of natural ovine dermatophilosis. This paper highlights some clinical features of atypical ovine dermatophilosis and we believe that this is the 1st published report of an outbreak of ovine dermatophilosis in Kenya.

CASE HISTORY

On 11 March 2006, a manager of a farm with a flock of 745 Dorper sheep (256 weaners and hoggets; 489 adults) reported the occurrence of skin lesions around the mouth and nose in 3 weaner sheep. The sheep were grazed on pasture during the day and paddocked at night and were provided with a mineral lick at night that was available to all *ad libitum.* On the farm, a clinical history of the condition was taken and this was followed by a clinical examination. The clinical examination revealed scabs around the nose and the mouth in the 3 sheep. Within 7 days after the 1st cases a total of 86 sheep had come down with the disease and by the 10th day when the last new cases were reported, a total of 237 weaners, hoggets and adult sheep had been affected. The morbidity rate within the flock was 31.8 % (237/745) with 98.3 % (233/237) of the affected sheep being weaners and hoggets. No fatalities were recorded. The outbreak occurred during the month of March which recorded a high amount of rainfall of 153 mm compared with the preceding months of December, January and February that recorded, 24 mm, 13 mm and 3 mm, respectively.

The affected sheep displayed varied types of lesions. Some had swelling of both the upper and lower lips (Fig. 1). In others, there were circumscribed lumps in the skin of both the upper and lower lips. Maceration of the affected skin due to the infection and abrasion as a result of grazing revealed deeply erythematous surfaces (Fig. 2). Some sheep had swelling of the head region and submandibular oedema, early in the course of the disease (Fig. 3). All the affected sheep were treated with an intramuscular injection of 20 mg/kg body weight of a long-acting oxytetracycline (20 %) (Adamycin LA®, Asia Pharmaceuticals Limited). Those with severe lesions received a 2nd dose of

[a]Department of Clinical Studies, Faculty of Veterinary Medicine, University of Nairobi, PO Box 29053-00625, Nairobi, Kenya.

*Author for correspondence.
E-mail: wabachajames@uonbi.ac.ke

Received: April 2007. Accepted: August 2007.

the same antibiotic after 3 days. In addition, all the affected sheep received a local treatment with an oxytetracycline antibiotic spray 3.6 % w/w (Alamycin®, Norbrook Laboratories).[12]

After 1 week of treatment, the lumps regressed in size and were covered by dark-brown scabs (Fig. 4). Shedding of the scabs revealed erythematous areas covered with purulent material and horny-erythematous projections (papillae) which by the 2nd week formed greyish scabs and later peeled off leaving alopecic areas around the lips (Fig. 5). Healing of the lesions was complete within 3 weeks.

A tentative diagnosis of ovine dermatophilosis was based on the clinical presentation and was confirmed through the demonstration of the bacteria in the scabs and through culture and biochemical identification[11,13]. Gram stain of the colonies revealed Gram-positive cocci in rows of multiseptate branched filaments which is characteristic of *Dermatophilus congolensis*. In culture, colonies which pitted the agar, were opaque, rough, irregularly shaped and were adherent to the agar, were isolated.

DISCUSSION

The morbidity rate among the sheep was higher in weaners and hoggets compared with the adult sheep. Similar observations have been made in the past[9,22]. Acquired immunity has been suggested to play a role[9] though circulating antibodies may not halt the disease once the disease is established[7].

The source of the outbreak could have been chronic lesions in sheep which had gone unnoticed [13,24,29,30] or it could have been cattle which had been reported to have had dermatophilosis 3 months earlier and were being kept close to the sheep[32]. New infections are known to occur *via* zoospores which are released when infected scabs become wet[31]. The yarding of the weaner sheep and hoggets at night and licking of the mineral lick from a common source could have facilitated further spread of the disease within the flock.

The distribution of the lesions around the lips and the muzzle was attributed to the mechanical damage of the skin by dry spiny plants, that the animals were feeding on[3]. The high precipitation at the time of the outbreak provided the necessary wetting of the lips and further caused the disruption of the skin barrier, enhancing the invasion of the living epidermal layers by the zoospores of *Dermatophilus congolensis*[3,9,13]. In addition to compromising the epidermal integrity, the moisture and the favourable temperature at the time could

Fig. 1: **Extensive swelling of both the upper and lower lips in sheep affected with dermatophilosis**.

Fig. 2: **Lumps in the skin of both the upper and lower lips in sheep with dermatophilosis** (note the maceration of the skin exposing erythematous lesions).

Fig. 3: **Submandibular oedema in a sheep with ovine dermatophilosis**.

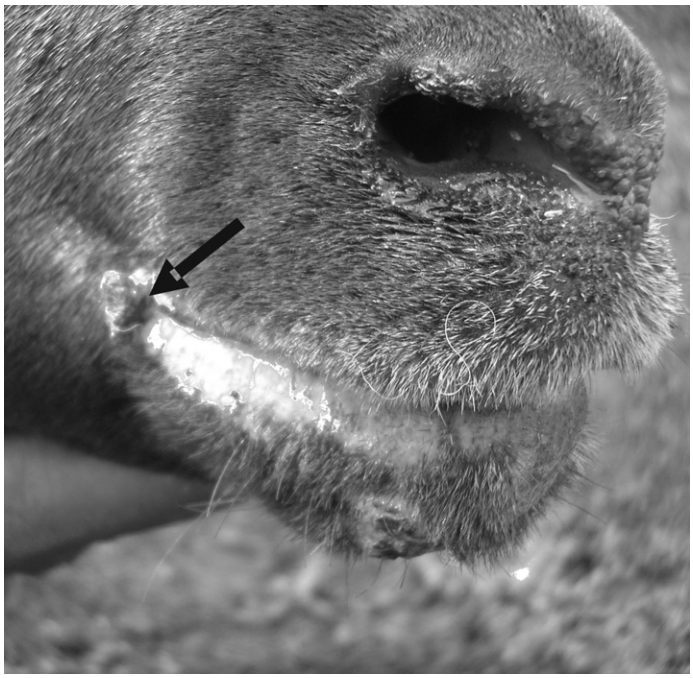

Fig. 4: **Appearance of the lumps 1 week following treatment. Note that the lump has regressed and the area of the lump is covered by a dark-brown scab** (arrow).

have activated the latent zoospores leading to bacterial invasion and the inflammatory responses as has been reported previously[21].

Dermatophilosis lesions are characterised by inflammation, production of serous exudates and crust or scab formation on the skin including those of the lips and muzzle[16,19]. In this outbreak, the clinical signs observed included extreme swelling of both the upper and lower lips and circumscribed lumps under the skin of the lips and dark-brown scabs. Zoospores germinate to produce hyphae which penetrate the living epidermis but do not usually penetrate the basement membrane zone[31]. In uncomplicated cases, the skin beneath dermatophilosis crusts and scabs is hyperaemic and not proliferative[19]. In the current case the skin beneath the lesions was proliferative and resembled that of 'strawberry footrot', a disease that occurs on the coronet of sheep. A disease similar to 'strawberry footrot' has been induced in sheep infected with orf virus and *Dermatophilus congolensis* together[2]. In the present study, though an attempt to isolate the orf virus was not made, simultaneous infection of *Dermatophilus congolensis* and orf virus could not be ruled out. Simultaneous occurrence of orf and ovine dermatophilosis in the field has been reported previously[5]. Secondary bacterial infections might complicate dermatophilosis lesions and this could explain the highly inflammed lesions observed in the outbreak[34].

Fig. 5: **Nearly healed lesions of ovine dermatophilosis, 2 weeks after treatment. Note the scabs and alopecic areas around the lips**.

A tentative diagnosis of dermatophilosis was made based on the clinical signs. However, due to various forms of epidermatitis that sheep with dermatophilosis may exhibit[16,28], the disease as was presented in this outbreak could have been confused with other diseases[26,31] that include ringworm, mange, actinobacillosis, orf, photosensitisation, mange and staphylococcal dermatitis. Diagnosis of ovine dermatophilosis was confirmed through demonstration of the bacteria in the scabs and through isolation from the lesions and identification by its morphological, cultural, and biochemical characteristics[11,13].

The lesions observed in this outbreak presented as acute exudative dermatitis and were severe enough to interfere with feeding of the sheep. Therefore, it was found necessary to treat the sheep. However, in mild cases it was recommended that no treatment be instituted as many mild to moderate cases of true 'lumpy wool' self cure[31]. Moreover, treatment of mild cases may delay the development of some resistance to the disease[6]. Although a combination of penicillin and streptomycin has also been found effective[25], the drug was not chosen because it poses the risk of prolonged tissue residues of streptomycin and the sheep were soon going for slaughter.

Although ovine dermatophilosis could be controlled through effective risk management such as tick control and control of biting flies, controlling the disease where the rough forage is the predisposing factor might prove a challenge as there might not be alternative feeds for the sheep to feed on as was the case on this particular farm.

ACKNOWLEDGEMENTS

We acknowledge the cooperation and commitment of the farm manager and his stockmen during the investigation.

REFERENCES

1. Abu-Samra, M T 1979. A study of the ultrastructure and the life cycle of *Dermatophilus congolensis. Zentralblatt fur veterinärmedizin* 26B: 110–124
2. Abu-Samra M T, Walton G.S 1981. The inoculation of rabbits with *Dermatophilus congolensis* and the simultaneous injection of sheep with *D. congolensis* and orf virus. *Journal of Comparative Pathology* 91: 317–329
3. Allworth M B, West D M, Bruere A N 1985. Ovine dermatophilosis in young sheep associated with the grazing of *Brassica* spp.

crops. *New Zealand Veterinary Journal* 33: 210–212
4. Amabrose N C 1996. The pathogenesis of dermatophilosis. *Tropical Animal Health and Production* 28: 29–37
5. Austwick P K C, Davies E T 1958. Mycotic dermatitis in Great Britain 1954–58. *Veterinary Record* 70: 1081–1086
6. Batey R 2003. Mycotic dermatitis (dermatophilosis) of sheep. Online: http://www.austbreed.com.au/
7. Bida S A, Kelly D C 1976. Immunological studies of antigenic components of *Dermatophilus congolensis.* In Lloyd D H, Sellers K C (eds) *Dermatophilus infection in animals and man.* Proceedings of a Symposium held at the University of Ibadan, Nigeria, 1973. Academic Press, London
8. Clements L O, Weavers E D 1980. *Dermatophilus congolensis* infection in lambs. *Irish Veterinary Journal* 34: 65–67
9. Edwards J R, Gardner J J, Norris R T, Love R A , Spicer P, Bryant R, Gwynn R V, Hawkins C D, Swan R A 1985 A survey of ovine dermatophilosis in Western Australia. *Australian Veterinary Journal* 62(11): 361–365
10. Gordon M A 1964. The genus *Dermatophilus. Journal of Bacteriology* 88: 509–522
11. Gordon M A 1980. Aerobic pathogenic *Actinomycetaceae.* In Lennette E H, Balows A, Hausler W J, Truant J P (eds) *Manual of clinical microbiology* (3rd edn). American Society for Microbiology, Washington, DC: 180–194
12. Gyang E O, Ilemobade A A, Shannon D 1980. Treatment of ovine dermatophilosis with long acting oxytetracycline. *Veterinary Record* 106: 106
13. Hart C B 1967. Mycotic dermatitis in sheep. 1. Clinical observations in Great Britain. *Veterinary Record* 79: 36–37
14. Jordan D, Venning C M 1995. Treatment of ovine dermatophilosis with long-acting oxytetracycline or a lincomycin–spectinomycin combination. *Australian Veterinary Journal* 72(6): 234–236
15. Jubb K V F, Kennedy P C, Palmer N 1985. *Pathology of domestic animals* Vol. I (3rd edn). Academic Press, Orlando, Florida
16. Kaminjolo J S 1988. *D. congolensis* infection in sheep. *Bulletin of Animal Health and Production in Africa* 36: 81–82
17. Le Riche P D 1968. The transmission of dermatophilosis (mycotic dermatitis) in sheep. *Australian Veterinary Journal* 44: 64–67
18. Martinez D, Prior P, 1991. Survival of *Dermatophilus congolensis* in tropical clay soils submitted to different water potentials. *Veterinary Microbiology* 29: 135–145
19. Radostitis O M, Blood D C, Gay, C C, Hinchliff K W 2000 . In *Veterinary Medicine: A textbook of the diseases of cattle, sheep, pigs, goats and horses* (9th edn). Saunders, Philadelphia: 938
20. Richard J L, Pier A C 1966. Transmission of *Dermatophilus congolensis* by *Stomoxys calcitrans* and *Musca domestica. American Journal of Veterinary Research* 27: 419–423
21. Roberts D S 1961. The life cycle of *Dermatophilus dermatonomus*, the causal agent of ovine mycotic dermatitis. *Australian Journal of Experimental Biology* 39: 463–476
22. Roberts D S 1963. Barrier to *Dermatophilus dermatonomus* infection of the skin of sheep. *Australian Journal of Agricultural Research* 14: 492–508
23. Roberts D S 1963. The influence of carbon dioxide on the growth and sporulation of *Dermatophilus dermatonomus. Australian Journal of Agricultural Research* 14: 412–423
24. Roberts D S 1963. Properties of *Dermatophilus dermatonomus* zoospores in relation to the transmission of mycotic dermatitis. *Australian Journal of Agricultural Research* 14: 375–385
25. Roberts D S 1967. *Dermatophilus* infection. *Veterinary Bulletin*, Weybridge 37: 513–521
26. Scott F M, Fraser J, Martin W B 1980. Staphylococcal dermatitis of sheep. *Veterinary Record* 107(25–26): 572–574
27. Scrivener C J, AI V 1995. Efficacy of a single dose of erythromycin or penicillin/streptomycin for the treatment of ovine dermatophilosis. *Australian Veterinary Journal* 72(12): 475–476
28. Sekin S, ElÍtok Ö M, ElÍtok B 2002. Natural ovine dermatophilosis: clinical aspects and efficacy of penicillin/ streptomycin treatment. *Turkey Journal of Veterinary Animal Science* 26: 1013–1019
29. Stewart G H, 1972. Dermatophilosis: a skin disease of animals and man. Part 1. *Veterinary Record* 91: 537–544
30. Stewart G H, 1972. Dermatophilosis: a skin disease of animals and man. Part 2. *Veterinary Record* 91: 555–561
31. Tonder van E M, Horner R F 1994. Dermatophilosis. In Coetzer J A W, Thomson G R, Tustin R C (eds) *Infectious diseases of livestock with special reference to South Africa,* Vol. II. Oxford University Press, Cape Town: 1472–1481
32. Wabacha J K, Gitonga N P, Njenga M J, Thaiyah A G, Mulei C M 2006 An outbreak of acute bovine dermatophilosis in a large scale dairy herd in Kenya. *Bulletin of Animal Health and Production in Africa* 54: 144–147
33. Wilkinson F C 1979. Dermatophilosis of sheep: association with dipping and effect on reproduction. *Australian Veterinary Journal* 55: 74–76
34. Yager J A, Scott D W 1993. The skin and appendages. In Jubb K V F, Kennedy P C, Palmer N (eds) *Pathology of domestic animals* (4th edn). Academic Press, San Diego: 648–651

Book review — Boekresensie

Strictly Scientific and Practical Sense. A century of the Central Veterinary Institute in the Netherlands, 1904–2004

P Verhoef (editor-in-chief and author of Part I)
J M van Leeuwen and P H Bool (eds Part II)
Translated from Dutch by R D Bigalke and R C Tustin
Text screening by Mrs J L Senior

2007. Erasmus Publishing, Rotterdam (http://www.erasmuspublishing.nl), 256 pp., hardcover. Price €64.50.
ISBN-10=90-5235-190-2

The sister institute of the Onderstepoort Veterinary Institute in the Netherlands, which can be referred to as a Central Veterinary Institute although it has experienced several name changes, became 100 years old in 2004. To commemorate this centenary, a team consisting of 2 retired scientists and a librarian, who had served the Institute faithfully over many decades (the 'History Project Foundation'), conceptualised and organised the production and publication of a splendid memorial book in Dutch that appeared in 2006 and was appropriately introduced to the Dutch veterinary and agricultural communities at 2 glittering ceremonies.

In 2004 R C Tustin and I had the good fortune of being invited by Dr P H Bool, convenor of the above team, to be involved in the translation of the Dutch version of the book into English. The English edition consists of 256 pages, having been condensed from the original 416 by the authors, and also consists of 2 parts. Its title is a less than satisfactory translation of the quotation *'Strenge wetenschappelijkheid en practische zin'*, which was the professional motto of Prof. Dr Jan Poels, famous founder of the Institute.

Part I of the Dutch edition of the book was written by the medical-historian, Peter Verhoef. It is 'a concise chronological history of the Institute' based on thorough research conducted mainly on the properly classified documentation available in well-organised institutional, national and municipal archives. Verhoef produced an abridged Dutch version of Part I for

translation purposes. It nonetheless remains an impressive and valuable record 'of the rich, and, at times, turbulent history of the Institute'; turbulent due to the virtually endless meddling by successive Dutch governments in the organisation of the Institute, to such an extent that some of its most eminent scientists retired prematurely. Doesn't that sound familiar? The primary reason for this was to limit the drain on the *fiscus* by merging the Institute with 3 others in the agricultural discipline so that posts could be abolished. The results of the restructuring are illustrated by means of concise organograms. To make matters worse, some of the reorganising coincided with the Ministry of Agriculture's revolutionary policy decision early in 1991 to dispense with annual vaccination against foot-and-mouth disease (FMD) in the Netherlands, thereby virtually closing the tap of the Institute's greatest source of income, the production of FMD vaccine for official use. In fact, the Institute was still in a state of transition in 2004. Small wonder that its centenary passed by almost unnoticed!

To increase its income and thus save research posts, the Institute became very actively market-orientated by promoting contract research, patenting its products and seeking EU and other sponsorship. It is amazing that the researchers continued to conduct fundamental research of international standard despite the continuous and real threat posed by the enforced reorganisation. The high quality of the research is evident in Part II of the book entitled: *Capita Selecta,* each chapter being written in English by the research scientists themselves, the editors contributing by controlling their style and language. Its contents have been divided into 5 clusters.

The research conducted by the Institute for the Dutch government is probably most clearly illustrated in the 3 chapters on FMD. The Institute's name is particularly associated with its world famous Frenkel vaccine for FMD. The technology used was the benchmark for the production of FMD vaccine in many other laboratories worldwide for many decades.

The intensiveness of animal husbandry in the Netherlands is clearly reflected in the cluster dealing with diseases causing practical problems. The discovery, in 1991, of the 'Lelystad' virus, which is responsible for 'blue ear disease' (now known as porcine reproductive and respiratory syndrome (PRRS)) – a disease first encountered in the USA and Canada in 1987 – was a scoop for the Dutch scientists who pipped everyone else at the post. Further proof of the industry-orientated nature of their research is the cluster in which research on furred animals and fish and shellfish is described. The botulism and mortality in the wild birds cluster reveals the existence of differences as well as similarities with our situation.

The 'multi-factorial' diseases, dealt with in the 4th cluster, are also a result of the intensiveness of the husbandry, especially by raising animals' production to within physiological limits. These diseases are not primarily infectious in nature. A new discipline, named Veterinary Pathophysiology, was therefore established to study them. An example of a multifactorial disease is the post-weaning diarrhoea syndrome of pigs that caused great economic losses in the Netherlands in the 1960s and 1970s. Several new techniques, such as the lung lavage method and the small intestine perfusion test, were developed to quantify pathophysiological research processes.

The cluster dealing with innovative research contains some very original and fundamental research, using molecular biological techniques, which nevertheless eventually resulted in patentable and/or marketable products. 'Deletion vaccines', which enable scientists to differentiate between infected and vaccinated animals (DIVA) – using genetically engineered, recombinant vaccines for this purpose – by means of the specially designed, monoclonal antibody tests required to do this (DIVA tests), were developed for Aujesky's disease, infectious bovine rhinotracheitis and classical swine fever. DIVA vaccines 'were among the 1st biotechnically engineered vaccines to reach the market and made the Institute a world leader in this respect'.

Equally original was the research that resulted in the development of a technique to synthesise multiple peptides in parallel on solid supports consisting of a set of pins in a holder, the pins fitting into the wells of a microtitre plate. This 'PEPSCAN' method is now applied in the Netherlands (by the privatised PEPSCAN company) and worldwide to produce the chemical 'building blocks for synthetic vaccines, diagnostic reagents and peptide pharmaceuticals'.

The quantitative veterinary epidemiology discipline is another example of research extending beyond the scope of infectious diseases as such. In this case a theoretical/mathematical approach was followed which included model studies, computer simulations and system analyses. Networking with the Wageningen University and the Faculty of Veterinary Medicine of Utrecht University resulted in excellent teamwork. 'Multi-factorial' diseases and strategies for the control of Aujesky's disease and classical swine fever were some of the fields of study.

The titles of the individuals referred to in the text will cause confusion to English readers not accustomed to the Dutch system. This system is probably unique in the world and therefore cannot be 'translated' into the English system, as explained by the editor.

The book also contains valuable appendices listing the Directors of the various featuring institutions (1904–date) and members of the Board of the Foundation (1958–date); the theses emanating from the Institute (1904–2003); a selected bibliography of Part I and an index of the persons mentioned in the text. An unusual feature is the use of so-called boxes in the text that contain useful additional information to the subject matter.

The book is printed on the best quality glossy paper, the selection of illustrations is excellent – particularly if one considers that many of them were photographed many decades ago – and the layout is entirely satisfactory. This book can indeed be regarded as a not easily bettered benchmark for centenary publications.

R D Bigalke
Chairperson: History Committee of SAVA