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THE 5TH LUSTRUM
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AIRLANGGA UNIVERSITY
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CONTENT

FOREWORD by CHAIRPERSON

CONTENT

ORGANIZING COMMITTEE

INVITED LECTURES

1. On the Numerical Solution of Interior Riemann-Hilbert Problem, Bahrom B. Sanugi
2. Designing Appropriate Strategies for Crop Improvement: from Basic to Advance Technology, Rudy Lukman
3. Function of Family-22 Carbohydrate-Binding Modules in Clostridium stercorarium Xylanase/Beta-Glucanase Xyn110b and Related Enzymes, Kazuo Sakka
5. Evaluation of Developmental Toxicity of X-Irradiation and 2-Methoxyethanol to Rats and Mice, Win Darmanto, Eko Prihyantoro, Minoru Inouye, Masaharu Ogawa, Katsumi. Mikoshiba, And Yoshiharu Murata
6. The Role of Ecotoxicology in Environmental Management, Agoes Soegianto
7. Improving Bifunctional Enzyme α-L-Arabinofuranosidase from Geobacillus thermoleovorans IT-08 By Site Directed Mutagenesis, Ni Nyoman Tri Puspaningsih, Y. Srikulan Manuhara, Slavko Kralj, Bauke W. Dijkstra, and Lubbert Dijkhuizen
8. Recent Topics of Fractional Integrals, Eridani
9. Molecular and Enzymatic Studies of Glucoamylase from Amylomyces Rouxii, Noor Aini Abd. Rashid
10. Organic-less Liquid Chromatography, Mohd Marsin Sanagi, See Hong Heng, and Wan Aini Wan Ibrahim
11. The Role of Biophysics Related Acupuncture Therapy, Suhrainingsih

GENERAL PAPERS

3. Timing Of Estrus Behavior Of Etawa Crossbred Does In Relation To The Preovulatory LH Surge, Kresno Suharto and Aris Junjadi
4. Modeling The Inhibitory Effect Of Oestradiol On Gnrh Pulse Frequency In The Male Reproductive Endocrine Axis, TR Ferasyi, PHR Barrett, D Blache and GB Martin
5. Further Studies Probit Analysis With Limited Group Samples Of Diminazene Versus Trypanosomes, Mocahmad Lazuardi
6. Herbicide 3-chloropropionate (3CP) degradation by Rhodococcus sp., Ng Hong Jing and Fahlul Huyop
7. The Role of Protease Producing Bacteria From Tilapias (Oreochromis niloticus) in Preventing the Growth Of Microcystis aeruginosa, Andri Taruna Rachmadi, Nisa Rachmania Mubarik, Tanuri Sri Prauwasti
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Influence of Vascular Arbucular Michelorhiza (VAM) and Effective Microorganism (EM4) For The Growth and Production of Mungbean (Phaseolus radiatus var. Betel), Tini Surtiningsih, Thin Soedart and Ishardini Dewi Jayati</td>
<td>28</td>
</tr>
<tr>
<td>Plant Growth Promoting Rhizobacteria Attributes of Pseudomonas sp Isolated from Rhizosphere of Soybean Plant, Rika Indri Astuti, Aris Tri Wahyudi, Giyanto</td>
<td>34</td>
</tr>
<tr>
<td>Suitability Of Goat's Milk In Making Yoghurt</td>
<td>38</td>
</tr>
<tr>
<td>The Improvement of Trickle-Bed Bioreactor for Decolorization of Dye Using Immobilized Fungal Biomass, Nuriza Ab. Latif</td>
<td>42</td>
</tr>
<tr>
<td>Screening of Chitinolytic Plant Growth Promoting Rhizobacteria for the Purpose of Whitefly (Bemisia tabaci Genn.) Controlling, Nisa Rachmania Mubarak, Imiti Mahagian, Sugeng Santoso</td>
<td>47</td>
</tr>
<tr>
<td>Antimicrobial Activity Of Bacillus Subtilis 3kp Biosurfactant Against Phytopathogenic Microbes Pseudomonos and Phyrun, N'Gatuzahro, Endah Sayekti, and Tri Nurlanafiya</td>
<td>51</td>
</tr>
<tr>
<td>Isolation and identification of three species of bacteria from the termite Coptotermes curvignathus (Holmgren) present in the vicinity of University Putra Malaysia, M. Ramin, A. R. Alimon, N. Abdullah, J. M. Panandam, K. Sijan</td>
<td>55</td>
</tr>
<tr>
<td>Short Term Intravaginal CIDR for Estrus Induction in Low Versus Ideal Body Score Condition of Etawa crossbred goats, Kresno Suharto, Aris Junaidi, Asmarani K and Diah Tri W</td>
<td>59</td>
</tr>
<tr>
<td>Timing of Estrus Behavior of Etawa Crossbred Does in Relation to the Preovulatory LH Surge, Kresno Suharto, Aris Junaidi, Asmarani K and Diah Tri Widayati</td>
<td>64</td>
</tr>
<tr>
<td>Effects of Post Mortem Conditioning on Tenderisation, Drip Loss and Cooking Loss Among Different Major Skeletal Muscles in Sheep, AR Hisham, AM Hilmi, AQ Sazili and AR Alimon</td>
<td>68</td>
</tr>
<tr>
<td>Intravaginal Insemination of Bitches With Fresh Semen, Franfisca Juwita, Patrick Krisnamurti, Aris Junaidi, Lia Wahyu, Ratna Normalisk, and Setyo Budi</td>
<td>71</td>
</tr>
<tr>
<td>The Effect of Java Ginseng (Talinum paniculatum Gaertn.) Root Extract in Mice With Low Level of Testosterone, Dwi Winarni</td>
<td>74</td>
</tr>
<tr>
<td>Biodegradation of the Azo Dyes Acid Orange 7, Acid Red 27, Direct Blue 15 and Reactive Black 5 using Recombinant Flavin Reductase, Mohd Firdaus Abdul Wahab, Noor Aini Abdul Rashid and Abdullah Rahim Mohd Yusoff</td>
<td>78</td>
</tr>
<tr>
<td>The Role of Biophysics Related in Acupuncture, Suwarningsih</td>
<td>87</td>
</tr>
<tr>
<td>Application of Computed Tomography on Quality Identification of Amethys Gem, Komang Gde Suastika and Gede Bayu Suparta</td>
<td>97</td>
</tr>
<tr>
<td>Translate-Rotate Computed Tomography Using an Efficient Sampling and Its Reconstruction Method, Khusnul Ain and Nuril Ukhrowiyah</td>
<td>101</td>
</tr>
<tr>
<td>Optimization Design of a Single Channel Analyzer for Computed Tomography System, Imam Sapuan, Gede Bayu Suparta and Kusminarto</td>
<td>104</td>
</tr>
<tr>
<td>Application of Elliptic Relaxation Approach in Turbulent Natural Convection, Gunarjo S.B</td>
<td>108</td>
</tr>
<tr>
<td>Analysis of intensity Distribution Profile From Gaals Laser At fraunhofer Diffraction System By Using The Digital Line CCD Sensor, Retna Apsari, Moh. Yasin, Sandy Fahamsyah</td>
<td>112</td>
</tr>
</tbody>
</table>

30. Optimization of Electroacupuncture Spike Pulse to Control Blood Sugar Level of Mice, Suryani Dyah Asztuti, Welina Ratnayanti, Tri Anggono P

31. On possibility of Using the Cop/ag/sio2 Hollow Fibers, As a Component of the Photoacoustic Spectroscopy, Pujiyanto

32. The Density, Velocity and Energy of Charged Particles Distribution Derived from ACE, SoHO and Ulysses Satellite Data, Dhani Herdiwijaya, Kapriasi N. Rahayu, Alida Ramadhika, and Deasy Tresnoingrum

33. Optimization of the Design of Pumps and Retention Ponds in the boezem of wonorejo Primary Canal, Surabaya, Vico D. Frihannedy dan M. A. Mardyanto

34. Selective Acylation of Aromatic Over Zeolite/Mesoporous Silica Composite Catalyst, Salasiah Endud, Mohd Zariff Zahari, Ka-Lun Wong

35. Mapping of Gene Encoding Glucoamylase Endomycopsis fibuligera ITB Rcc64 (GLO1) in T Vector Recombinant, Purkun, Sofijan Hadi, Ni Nyoman Tri Puspaningsih, Dessy Natalia and Ali Rohman

36. The Utilization of Molis Reagents as Spraying Agents for Thin-Layer Chromatograms of Carbohydrates, Anak Agung Isri Ratnadewi, Ni Nyoman Tri Puspaningsih, and Muhammad Naqib

37. Polypyrrole/1,10-Dibenzy1-1,10-Diazal-18-Crown-6 Electrode as Voltammetry Sensor of Hg2+ Ion in Picomolar Concentration, Muji Harsini, Buchari, Indra Noviandri, Susanto Imam Rahayu

38. Purification of Trichoderma reesei Cellulohydrilase I (CBH I) using Ion Exchange Chromatography, Amelia Suhana Zamri, Osman Hassan, Amir Rabu, Abdul Munir Abdul Murad, Nor Muhammad Mahadi and Farah Diba Abu Bakar


40. The Production of Cellulose Diacetate Membrane from Pineapple Leaf Fibre (Ananas comosus), Errik Indrapraja, Tokok Adiarto & Siti Wafiroh

41. Determination of Xylanolytic Enzyme Activity Expressed in E.Coli Dh5a (Ptp510) At Various Enzyme Location, One A, Ani T.K, Sri S, Ni Nyoman T.P

42. An NAD+, Mn2+ and DTT-dependent a-galactosidase from Bacillus halodurans, Andian Ari Anggraeni, Makiko Sakka, Tetsuya Kimura, Motomitsu Kitaoka, and Kazuo Sakka

43. High Temperature Reaction between Pyrite and Ammonium Nitrate, Richard R. Gunawan, Dong-ke Zhang

44. The Effect of Alkali Pretreatment on the Deconstruction of Lignocelluloses from Oil Palm Fiber, Rahmi Kamelia Syahril, Rosli Md Illias, Suraini Adb.Aziz, Abd Munir Abd Murad, Farah Diba Abu Bakar, Nor Muhammad Mahadi and Osman Hassan

45. Synthesis and Catalytic Activities of The Immobilized Tungstophosphoric Acid in The Platinum Promoted经济社会ization of n-Pentane, Wong Hon Loong, Mohd Ridzuan Omar Sani, Sugeng Triawhyno and Mustafia Shamsuddin

46. Optimization of jatropha curcas I. Methyl ester epoxidation with amberlite ir-120 catalyst, Purwantiningsih Sugita, Ahmad Sjafriza, Budi Arifin dan Joko Soeharto

47. Direct Immersion Solid Phase Microextraction for the Forensic Detection Of Explosives in Post-Blast Water Samples, Umi k. Ahmad & Kiu kee heng

48. Photocatalytic Degradation of Pentaclorophenol With TiO2 With Immobilization in Glass Column, Hamami, Yusuf Syah, Farid Zainal

49. Modification of Porous Polyethersulfone Hollow Fiber Membrane by Blending With Surfactant Tetronic, Nasrul A Rahman, Tomohiro Sozani, Hideto Matsuyama
50. Ribotyping Based Analysis of Thermophilic Communities Using Culture Dependent Approach A.L.N. Aminin1,2, F. Madayanti3, P. Aditawati4, and Akmaloka ... 207
51. Production of Dental Plaque Glucan by Extracellular Glucosyltransferase of Streptococcus mutans, Afaf Bakti5, Dian Anggraini2, Indah Listiana Kriswandini6, Sofiyan Hadi ... 211
52. Proteolytic Activity of Crude Proteases Extracted from Digestion Organ of Skipjack Tuna, Ahmad Sjaifullah ... 217
53. The Exploitation Of Kutorejo Mojokerto Clay As Buffer Isolation Material For Industrial Product, Abdullah ... 220
54. Kinetic study of jatropha curcas L. Methyl ester epoxidation reaction with amberlite ir-120 catalyst, Purwantiningastri Sugita, Ahmad Sjafriza, Budi Arifin*, Joko Subarto ... 224
55. A Look at Separation in Capillary Columns: Selected Fungicides Separation in Capillary Electrophoresis With Micelles, Wan Ani Wan Ibrahim, Naemah Aubid, Dadan Hemawan and Mohd Marsin Sanagi ... 228
56. Maximum Matching in Multiparite Graph, Liliek Susilowati ... 233
57. Secret Sharing Scheme Based on Magic Labeling of Star, I W. Sudarsana, Junaidi ... 237
58. Application of Squashing Method to the Large Data From Generalized Pareto Distribution, Eto Wuryanto2 and Dyah Herawati ... 240
59. On the New Construction of Super Edge-Magic Total Graphs, I Wayan Sudarsana1, Junaidi ... 244
60. The Singly Truncated Normal Distribution: A Non-Steep Exponential Family, Riniuljo Hendradi ... 250
61. Multipredictor Nonparametric Regression Models With Lognormal Errors: a Comparative Based on Penalized Spline and Kernel Estimators Using Gmelina Arborea Roxb Data, Nur Chaminah and Toha Saituddin ... 254
62. Outlier Detection for the Value of Y Variable (Residual Outlier) in Multivariate Regression Models, Makkulua1, Susanti Limuwih2, Purhadi2, Mariful ... 258
63. The Spectral Density Matrix for the First Order Space Time AR Model, Nunung Nurhayati1, Udjianna S Pasaribu1, Oki Nesarun2, dan Sutawanir Darwis ... 263
64. Secret Sharing Scheme Based on Magic Labeling of Star, I W. Sudarsana, Junaidi ... 267
65. Regression Analysis of Productivity at PT. XXX Using Mixed Effect Model, Indriati Njoto Biseno, Siana Halim ... 267
66. The Ramsey Numbers for Disjoint Union of Stars, Hasmiwati, H. Assiyatun, E.T. Baskoro, A.N.M. Salam ... 271
67. Ship Hull Design Using Partial Differential, Equation with Three Vector Valued Shape Parameters, Zainor Ridziawan Yahya, Jamaludin ... 278
68. Qualitative enzyme immunoassays for the rapid assessment of progesterone in canine serum, Ratna Normaliska1, Aris Junaidi1, and Sri Gustari ... 282
69. On preservability properties of a multifrequency Model of a Pulse-width-Modulated DC-DC Cuk Converter, Yusuf Fuad ... 285
70. The Existence of Hamiltonian Cycle of a Graph Using Incidence Matrix, Yayuk Wahyuni and Liliek Susilowati ... 289
71. A Note of Robust Least Median Squares Estimator, Suliyanto ... 293

ABSTRACT of POSTERS PRESENTATION
Timing of estrus behavior of Etawa crossbred does in relation to the preovulatory LH surge

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Abstract

The temporal relation between the luteinizing hormone (LH) surge and the occurrence of sexual behavior was investigated in Etawa crossbred does. Estrus was synchronized in 4 Etawa crossbred does with a 10-day intravaginal CIDR, and injection of 125 µg cloprostenol i.m. 48 h before CIDR removal. Onset and duration of estrus were monitored visually and using vasectomized buck. Blood sampling was carried out every 3-6 hours from 0 hours through 66 hours after CIDR removal. The onset and duration of estrus after CIDR removal were 25.2±0.98 h and 37.4 ± 3.1 h, respectively. The preovulatory LH surge appeared 45-51 hours after CIDR removal. The interval after CIDR removal to the onset of the LH surge differed considerably among individuals, the receptivity (defined as an acceptance of male’s mounting) occurred well synchronized with the LH surge in each female. The receptivity was always seen around the time of LH surge suggesting an existence of causal relationship between this preovulatory events. The results of the present study clearly demonstrate that CIDR plus PGF₂α induce an estrus and LH surge among individual Etawa crossbred does and high kidding rate. This study was also suggest that AI would be best if applied in the mid of estrus in Etawa crossbred does.

Keywords: Etawa crossbred goats; Estrus synchronization; CIDR, LH surge.

1. Introduction

Accurate prediction of preovulatory events facilitates efficient reproductive management in artificial insemination (AI) program. Knowledge of the timing of ovulation permits precise timing of breeding, and AI. A routine synchronisation treatment using intravaginal controlled internal drug release (CIDR) device for 10 days, together with a prostaglandin injections 2 days before CIDR removal, efficiently induces and synchronises oestrus and ovulation during the breeding as well as the non-breeding seasons in goats (Freitas et al, 1996; Pierson et al, 2001; Junaidi and Norman, 2005). Although these systems have proven to be effective, there is some variability in the time to estrus, the LH surge, and ovulation. Little is known regarding the preovulatory LH surge in Etawa crossbred goats. Therefore, the objective of this study was to determine the timing of estrus behavior of Etawa crossbred does in relation to the preovulatory LH surge.

2. Materials and methods

2.1. Animals and location

The age and weight of the animals ranged from 2 to 4 years and 35 to 40 kg, respectively. The studies were carried out at UPTD,BPT-HMT, Singosari, Malang, East Java. The animals were housed indoors, and were fed a commercial concentrate (a mixture of corn, oat and barley containing 16% of crude protein) consumed per doe per day varied between 500 and 800 g once a day, fresh grass twice daily, and water ad libitum.

2.2. Estrus synchronization

Estrus was synchronized in all goats by means of intravaginal CIDR (CIDR-g, Pharmacia & Upjohn Pty Limited, NSW) impregnated with 0.3 g progesterone inserted for 10 days, and injected with prostaglandin F₂α (125 µg of Cloprostenol, Jaramet®, Jurox, Australia) i.m. 48 h before CIDR removal.

2.3. Estrus detection

Onset and duration of estrus were detected every 4 ± 1 h, from 0 to 78 h after CIDR removal. Goats were checked visually and considered to be in estrus when they showed outward signs including vigorous tail-swishing, reddening of the vulva, vaginal discharge of mucus, homosexual behaviour. Goats were also exposed individually to the vasectomized buck, and considered to be in estrus when allowing to be mounted by the buck. The first observation of
one of the signs was recorded as onset of oestrus. The duration of oestrus was recorded as the time from when the doe showed a sign of oestrus to the time when the doe rejected mounting by the buck.

2.4. Identification of the time of the LH surge
Blood samples were collected at 27 h and 33 h, then every 3 h for up to 54 h, then at 60 h and 66 h after CIDR removal. Blood was collected from the jugular vein using 5-ml heparinized vacutainer tubes. Samples were kept at a. approximately 4 °C before processing. Plasma was separated by centrifugation (4 °C, 1500 x g, 30 min) and stored at -20 °C until assay. Plasma LH concentrations were measured by ELISA (LH DETECT®, Reprokit; INRA centre de Tours –FRC, 37380 Nouzilly, France) as describe by Maurel (1991). The time of the LH surge was identified as follows. The first sample of each animal was used to define its basal level. The surge was said to be on going in the first sample when a fivefold increase in LH concentrations over the basal level was detected.

2.5. Artificial insemination (AI)
All females in oestrus until 30 h after CIDR removal were inseminated, as Baril et al. (1993) have demonstrated that females coming into oestrus later than 30 h after CIDR removal display a reduced fertility. AI was performed with double dose of frozen semen prepared in 0.25 ml straws according to the method described by Baril et al. (1993). All straws used in the experiment were prepared from one buck (BIB, Singsosari, Malang). Each straw contained 39 millions of total spermatozoa. Post-thawing motility was 41 %. At kidding, data on fertility and prolificacy were recorded.

2.6. Statistical analysis
The time of oestrus or of the LH surge after CIDR removal and conception rate after AI were analysed by ANOVA (GraphPad Prism version 3.00 for Windows, GraphPad Software, San Diego California USA, 1999).

3. Results

3.1. Estrus
The proportion of females exhibiting oestrus was 100% (Table 1). Initiation of oestrus following CIDR removal was 25.2 ± 1.3. The duration of oestrus was 37.4 ± 3.1 (Table 1).

3.2. LH surge
The LH surge occurred in all animals range between 45 to 51 h after CIDR removal. The LH surge happened when the animals were in oestrus (Fig. 1). The peak LH values range from 16.7 ng/ml to 371 ng/ml (Fig. 1). Mean (± sem, n=4) plasma concentrations of LH (ng/ml) at 45 h, 48 h, 51 h after CIDR removal were 9.9±9.1; 4.5±4.0; 18.2±9.1, respectively.

3.3 Kidding rate and fertility after AI
Overall kidding rate (fertility) after AI was 79% (3/4). Gestation length was 155 ± 1.7 (Table 1).

Table 1. Estrus response, interval from treatment to oestrus, duration of the induced oestrus, and fertility following treatment with CIDR and PGF2α (mean ± sem).

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<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
</tr>
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<tbody>
<tr>
<td>Does treated</td>
<td>4</td>
</tr>
<tr>
<td>Estrus response (%)</td>
<td>100</td>
</tr>
<tr>
<td>Onset of oestrus (h)</td>
<td>25.2±1.3</td>
</tr>
<tr>
<td>Duration of oestrus (h)</td>
<td>37.4±3.1</td>
</tr>
<tr>
<td>Does kidded</td>
<td>3</td>
</tr>
<tr>
<td>Fertility (%)</td>
<td>75</td>
</tr>
<tr>
<td>Single</td>
<td>2</td>
</tr>
<tr>
<td>Twins</td>
<td>1</td>
</tr>
<tr>
<td>Kidding (%)</td>
<td>3/4 (75)</td>
</tr>
<tr>
<td>Gestation (days)</td>
<td>155±1.7</td>
</tr>
</tbody>
</table>

Fig. 1. Time (hours) of LH surge in Etawa crossbred goats after CIDR removal.

4. Discussion
The ability of the CIDR combine with PGF2α to synchronize the beginning of oestrus and control the timing of the LH surge, were good. Observations of physiological factors such as time of occurrence of oestrus and preovulatory LH peak were a useful strategy for understanding decreased fertility. Furthermore, the LH surge
much more precise and efficient tool to determine ovulation time in females. In fact, the time interval between the LH surge and ovulation is rather constant (Leboeuf et al., 1996) in contrast to the time interval between estrus and ovulation, which displays a large variability. Our results showed that females displaying estrus had LH surge at the mid or late of estrus.

The LH surge was recorded at a mean time of 41-51 h after CIDR removal. In agreement with previous study (Pierson et al., 2001), the interval from CIDR removal to estrus was found to be the most critical and, hence, the factor predicting the occurrence of the LH surge and ovulation. CIDR removal and treatment with PGF2α directlyinitiated the endogenous GnRH peak which resulted in the LH surge. Cameron et al. (1988) reported similar results, although in their study, ovulation occurred between 36 and 48 h. As in other studies (Pierson et al., 2001), season had a significant effect on the timing and the synchrony of estrus. These results indicate that the estrus synchronization protocols may be useful when precise timing of ovulation is required. By improving the synchrony of the LH surge and ovulation, it will facilitate the implementation of fixed-time breeding and AI in Etawa crossbred goats. It is also useful to consider the effect of AI at a fixed time after CIDR treatment. Between females, a natural variability in the time of ovulation was reported (Freitas et al., 1997). The breeding schedule ensured that sperm were present in the reproductive tract about 20 h before ovulation began. In goats that ovulated belatedly, the time interval between AI and ovulation was no longer optimum, and therefore the waiting time of spermatozoa in the genital tract of females before fertilization was prolonged. Earlier workers reported that low fertility rates were obtained in goats that came into estrus 30 h after prostegesterone sponge removal (Baril et al., 1993) or in goats inseminated less than 5 h after the LH peak (Maurel et al., 1992). In contrast, when goats with late estrus were inseminated with a 6-h delay (at 49 h instead at 43 h after the progestogen treatment), fertility was partially restored (55.5% vs. 42.3%; Leboeuf et al., 1996). In this present study, AI between 12 to 14 h after onset of estrus result in high conception rate (75%). This finding in agreement with previous report in goats AI using frozen-thaw semen at the mid of estrus (Leboeuf et al., 1996).

The results of the present study clearly demonstrate that CIDR combine with PGF2α induce an estrus and LH surge among individual Etawa crossbred does and suggest that AI would be best if applied in the mid of estrus in Etawa crossbred does.

5. Acknowledgements
We thank to the Directorate of UPTD, BPT-MHT, Singosari, Malang (Mr. Dwi Irianso, DVM), who provide the facilities and the animals for this study.

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