RON SHAHAR

CURRICULUM VITAE

1. PERSONAL DETAILS

Date of birth: October 2nd 1949
Country of Birth: Israel
Identity number: 03013418-3
Nationality: Israeli
Family status: Married, two daughters
Permanent address: 4 Hahadarim Street, Moshav Sede-Warburg, 44935 Israel
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2. HIGHER EDUCATION

1967-1971 Technion Institute of Technology, Haifa, Israel, Bio-Mechanical Engineering, B.Sc.
1974-1977 Weizmann Institute of Science, Rehovot, Israel, Applied Bio-Mathematics, M.Sc.
1978-1983 Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada, D.V.M.
1983-1984 Western College of Veterinary Medicine, University of Saskatchewan, Canada. Rotating internship - Small animal medicine and surgery.
1992.1994 Koret School of Veterinary Medicine, The Hebrew university of Jerusalem, Residency - Small Animal Surgery, Supervising Diplomate: Prof. D.E. Johnston.
1998.2003 Fleischman Faculty of Engineering, Tel Aviv University, Bio-Mechanical Engineering, PhD, Supervisor: Prof. L. Banks-Sills.

3. APPOINTMENTS AT THE HEBREW UNIVERSITY

1995 Clinical Lecturer, Koret School of Veterinary Medicine
2000 Clinical Senior Lecturer, Koret School of Veterinary Medicine
2007 Clinical Associate Professor, Koret School of Veterinary Medicine
2009 Research Associate Professor, Koret School of Veterinary Medicine

4. ADDITIONAL FUNCTIONS/TASKS AT THE HEBREW UNIVERSITY

1996-2004 Head, Department of Surgery and Anesthesia, Veterinary Teaching Hospital
1996-2004 Member, Resident & Intern Committee.
2000-2003 Academic Director – Veterinary Teaching Hospital
2000-2003 Head, 4th year Committee

2000-2003 Associate Director for Clinical Affairs – Koret School of Veterinary Medicine
2003-2007 Head, Development committee, Koret School of Veterinary Medicine
2008 – Head, committee for clinical research and academic advancement
2008 – member, Development committee, Koret School of Veterinary Medicine
2010 – Director, Veterinary Teaching Hospital

5. SERVICE IN OTHER ACADEMIC AND RESEARCH INSTITUTIONS

2002-2004 Department of Clinical Studies, Ontario Veterinary College, Canada. Consultant and collaborator for the Doctor of Veterinary Science thesis, for Dr. Michelle McDonald
2004-present Weizmann Institute of Science, visiting scientist.

6. OTHER ACTIVITY

Member of editorial board of the following journals:
Veterinary Surgery
Journal of Veterinary and Comparative Orthopedics and Traumatology

Reviewer of manuscripts for the following journals:
Veterinary Surgery
Journal of Veterinary and Comparative Orthopedics and Traumatology
The Veterinary Journal
Journal of Anatomy
Journal of Biomechanics
Calcified Tissue Research
Journal of Bio-electro-magnetics
Journal of Biomedical Engineering Online
Journal of Structural biology
Journal of Materials Chemistry
Refuah Veterinarit (Hebrew journal)

Reviewer of proposals submitted to the following funding agencies:
Israel Science Foundation (ISF)
German Israel Fund (ISF)
Chief scientist, Israeli Ministry of Health

Membership in Professional Societies
European College of Veterinary Surgeons
European Society of Veterinary Orthopedics and Traumatology
European Society of Biomechanics
American Society of Bone and Mineral Research

Other:
Judge of posters at the annual meeting of the European College of Veterinary Surgeons (2003).

Judge of posters at the bi-annual meeting of the European Society of Biomechanics (2004).

7. RESEARCH GRANTS

1. 1998-2003: HUJI internal grants: The relation between the presence of estrogen and progesterone receptors and mammary neoplasia in dogs – a prospective study. Co-PI (with Dr. Merav Shamir). $10,000/20,000.
2. 2002-2005: US friends of the Hebrew University: Investigation of the pathogenesis of osteoarthritis by *in-vivo* experiments, and by numerical and theoretical models. PI. $22,000 /22,000.
3. 2004: British Veterinary Orthopedic Association, Pull-out force of 4.5 mm and 3.5mm cortical screws from the canine distal humerus, Collaborator: Dr. Mark Glyde, Eu 750/3500.
4. 2007-2009 MOEZET HALOOL: The effect of management on skeletal quality in laying hens. 35,000/90,000 NIS/year for 3 years. Co-PI, with Dr E. Monsenago (Faculty of agriculture, HUJI) and Mr I. Malca (ministry of agriculture).
5. 2007: HUJI internal grants – innovative science. The influence of leptin administration on growth and skeletal Development of IUGR newborns. 10,500/21,000$. Co-PI (with Prof. Ram Reifen).
6. 2008-2009. Hohenheim grant. The effect of weight loading and unloading on the post-natal skeleton. 11,000/22,000 Euro/per year. Co-PI, with Dr. Efrat Monsonego-Ornan (Faculty of Agriculture (HUJI) and Prof. Michael Grashorn (Hoenheim University).
7. 2008-2009. Niedersachsen grant: experimental and theoretical study modeling pelvic osteotomies to treat hip dysplasia in children and dogs. 35,000/70,000 euro-2 years. Co PI, with Dr. Thomas Pressel, Hannover School of Medicine.
8. 2008-2009: US friends of the Hebrew University, Dynamic Crack Propagation in Bone Using Fast Digital Holographic Interferometry. PI. 24,000 /24,000 $.
9. ISF 2008: Investigation of the elastic, viscoelastic and fracture properties of osteoporotic cortical bone using a novel optical metrology method. PI, 150,000/150,000 IS per year/ for 3 years.
10. 2009 – 2010: Center for Nutrigenomics Research . The role of Omega-3 polyunsaturated fatty acids in bone development and its long term effects. Co PI (with Dr. E. Monsonego-Ornan, Faculty of Agriculture), 15,500/31,000$-2 years.
11. 2010-2012 MOEZET HALOOL: Enhancing broiler welfare through the enrichment of the embryo with vitamin D, calcium, phosphorus and glucose before hatch to improve skeletal quality. 54,000/108,000 NIS/year for 3 years. Co-PI, with Dr Z. Uni (Faculty of agriculture, HUJI)
12. Discipline Bridging Initiative grant, 2009. This grant was received from Queen Mary University (London, UK), to investigate the mechanical properties of osteoporotic bone at nanoscale dimensions. Small volumes of bone will be prepared in the UK using ion beam methods and mechanically testing using atomic force microscopy. Co PI, with Dr. Asa Barber, 3400 £

8. TEACHING AT THE HEBREW UNIVERSITY

a) Supervision of Master's and doctoral degree students

Masters degree student:

2004-2008 Alon Wexler (D.M.D), co-supervisors - Prof. Ilana Brin, Dr Nardi Caspi (both from the School of Dentistry, Hebrew University). Finished with distinction.

2008 – present – Olga Selnikov. co-supervisor: Dr Efrat Monsonego-Ornan.

Doctoral degree students:

2004 - present Amnon Sharir (D.V.M), co-supervisor- Dr. Elazar Zelzer, (Department of Molecular Genetics, Weizmann Institute). (articles # 31, 39, 43, 46, 49)

2004 – 2009 Meir Barak (D.V.M), co-supervisor - Prof. Steve Weiner (Department of Structural Biology, Weizmann Institute). (articles # 39, 40, 42, 46)

2005 – present Assaf Marom (MD/PhD Student at TAU medical school co-supervisor – Prof. Yoell Rak, Medical School, Tel Aviv University)

2008 – present Anna Shipov (D.V.M),

Residency supervisor - Surgical Residents:

1998 - 2001 Joshua Milgram (D.V.M) (articles # 12, 18, 20, 25, 28, 29, 31, 48, 49)

1998 – 2001 Sigal Yudelevich (D.V.M) (article # 13)

1998 - 2002 Yonatan Shani (D.V.M) (articles # 14, 19, 21, 30, case Report # 7)

2000 - 2003 Yoav Bar-Am (D.V.M) (article # 24, case report # 9)

2001- 2004 Ronit Merchav (D.V.M) (article # 27, case report # 8)

2003 – 2006 Rotem Josef (D.V.M) (article # 29)

2004 - 2007 Anna Shipov (D.V.M) (article # 49, case report # 10)

2007- present Hadas BenZioni (D.V.M) (articles # 41, 44)

2007 – present Liat Cohen (D.V.M)

Current DVM student thesis

Lilach Haker – The effect of load on the mechanical properties of chick tibiae. (article # 43)

Anat Kohn – Comparison of the mechanical properties from bones of normal-muscled and double-muscled cows.

Dana Sarig – Finite element modeling to investigate the mechanical consequences of glaucoma on the optic nerve

Yaara Yarmut – Morphometry of muscles of various strains of mutant mice

Sophie Soiffer – Finite element modeling of methods used to treat hip dysplasia in children and dogs

Nily Kahane – Finite element modeling of the canine cervical vertebral column to compare treatments of cervical instability syndromes

Alex Weis - - Comparison of the biomechanical and structural

parameters of the long bones of two strains of layers along the entire laying cycle

Shahar Mizrahi - The effect of leptin antagonist on the long bones of mice

Bat El Avneri - the effect of leptin administration to pregnant mothers or the offspring on the skeleton in a model of IUGR in rats.

Anat Bloch - The effect of avian tibial dyschondroplasia on the structure and mechanical properties of the skeleton.

Gilad Factor - Experimental model of TPLO to measure displacements and rotations of the tibia

Sharon Pappo - Correlation studies on the distribution of osteons in long bones of dogs and horses

Sivan Lacker - The structure of the shell of the red eared slider by histological analysis

M.Sc, PhD committees

Adi Reich – Ph.D. committee, Animal Science department, Faculty of Agriculture, The Hebrew University of Jerusalem

Royi Padan – M.Sc. thesis committee, Faculty of Engineering, Ben Gurion University

Ronit Mann – M.Sc. thesis committee, Biomedical Engineering, Tel Aviv University

Gili Solomon - Ph.D. committee, Institute of Biochemistry, Faculty of Agriculture, The Hebrew University of Jerusalem

Supervisor of "Amirim" Program students

2004 – 2005 Yuval Semrik

2004 – 2005 Naama Goren

2004 – 2005 Anat Bloch

c) Courses taught

1. Small animal surgery – 3rd year. Course supervisor. Course given to the third year class of the Koret School of Veterinary Medicine. Coordinator of the general course of small animal surgery, given during both semesters of their third year of studies. Specific topics taught by me include: veterinary orthopedics, surgery of the head and neck, thoracic surgery and cardiovascular surgery.
2. The structure and mechanical function of bone. Course offered to post-graduate students (M.Sc, Ph.D) of the Animal science department, Faculty of Agriculture.
3. BioMineralization. 1 lecture within this course, on bone mechanics, which is given at the Weizmann Institute. Course coordinators: Prof. Lia Addadi and Prof. Steve Weiner.

Teaching Award

Ranked at the upper level of teaching quality surveys every year between 1994 and 2007, and received letters of appreciation for excellence in teaching from the rector and from the dean several times.

LIST OF PUBLICATIONS

Key to symbols and abbreviations

Principal investigator	PI
Co-researcher	C
Technician/laboratory assistant	T
Student	S

1. **Doctoral Dissertation**

Biomechanical aspects of the canine hind limb. Supervisor: Prof. Leslie Banks-Sills, January 2004. The dissertation was published as a PhD thesis in 2004 in Tel Aviv University. Publications resulting from the dissertation: # 12, 15, 16, 17, 23

2. **Books**: none

3. **Books edited**: none

4. **Chapters in Collections (and invited papers)**

1. Zaslansky, P.[PI], Pedrini, G[PI]., Alexeenko, I.[C], Osten, W.[C], Friesem, A[C]., Weiner, S[PI]., **Shahar, R[PI].** Static and dynamic interferometric measurements used to determine mechanical properties of cortical bone, in *Advances in Mechanics*, edited by Carmine Pappalettere, pp. 76-77, McGraw-Hill, Milano, 2004
2. Biomineralization handbook

5. **Articles**

(* most important articles since last promotion)

1. **Shahar, R.[PI]** and Liron, N. [C] (1978). Stokes flow due to a stokeslet in a pipe. J. Fluid Mech. 186:722-44. 1.811;5/106; 42.

2. **Shahar, R.[PI]** and Holmberg, D.L.[PI] (1985). Pleural dialysis in the management of acute renal failure in two dogs. J. Am. Vet. Med. Assoc. 187:952-4. 1.404;11/120;1.

3. Harari, R., [T] **Shahar, R.,[PI]** Zuckerman, A.[C] and Nyska, A.[PI] (1995). Silver stained nucleolar organizing regions (AGNORS) in canine mammary tumors measured by image analysis and direct counting: correlation to histology and clinical behavior. Israel J. Vet. Med. 50:147-55. journal does not appear in the citation index

4. Shamir, M.H.,[PI] **Shahar, R.[PI]** and Johnston, D.E.[C] (1996). Semirigid external fixation for repair of fractures in young animals. J. Am. Anim. Hosp. Assoc. 32:521-6. 1.052;25/120;4.

5. **Shahar, R.,[PI]** Shamir, M.H., [C] Niebauer, G.W.[C] and Johnston, D.E.[PI] (1996). A possible association between acquired nontraumatic inguinal

and perineal hernia in adult male dogs. Can. Vet. J. 37:614-6. 0.472;70/120;5.

6. **Shahar, R.,[PI]** Shamir, M.H.[C] and Johnston, D.E.[PI] (1997). A technique for management of bite wounds of the thoracic wall in small dogs. Vet. Surg. 26:45-50. 1.196;17/120;12.

7. **Shahar, R.,[PI]** Harmelin, A.,[C] Shamir, M.H.[C] and Schneebaum, S.[PI] (1997). Immunoreactivity of canine mammary neoplasms with monoclonal antibody CC49. J. Vet. Med. Series A ,44:317-23. 0.558;64/120;0.

8. Shamir, M.H.,[PI] **Shahar, R.[C]** Johnston, D.E.[PI] and Mongil, C.M.[C] (1999). Approaches to esophageal sutures. Comp. Cont. Ed. Prac. Vet. 21:414-20. 0.478;69/120;3.

9. **Shahar, R.,[PI]** Shamir, H.M.[C], Brehm, D.M.[C] and Johnston, D.E.[C] (1999). Free skin grafting for treatment of distal limb skin defects in cats. J. Sm. Anim. Prac. 40:378-82. 0.768;40/120;1.

10. **Shahar, R.**[PI] (2000) Relative stiffness and stress of type I and type II external fixators: acrylic versus stainless-steel connecting bars – a theoretical approach. Vet. Surg. 29:59-69. 1.196;17/120;11.

11. **Shahar, R.[PI]** (2000). Evaluation of stiffness and stress of external fixators with curved acrylic connecting bars. Vet. Comp. Orthop. Traum. 13:65-72. 0.430;73/120;4.

12. **Shahar, R.[PI]** and Milgram, J.[C] (2001). Morphometric and anatomic study of the hind limb of a dog. Am. J. Vet. Res. 62:928-33. 1.182;18/120;9.

13. Leisner, S.,[PI] **Shahar, R.,[PI]** Aizenberg, Z.[C] and Lichovsky, D.[C] (2001). The effect of short duration, high intensity electromagnetic pulses on fresh ulnar fractures in rats. J. Vet. Med. Series A, 49:33-7. 0.558;64/120;5.

14. Shani, Y.[PI] and **Shahar, R.[PI]** (2001). The unilateral external fixator and acrylic connecting bar, combined with IM pin for the treatment of tibial fractures. Vet. Comp. Orthop. Traum, 15:104-10. 0.430;73/120;0.

15. **Shahar, R.[PI]** and Banks-Sills, L.[PI] (2002). Biomechanical analysis of the canine hind limb: calculation of forces during three-legged stance. The Vet. J. 163:240-50. 1.250;16/120;12.

16. **Shahar, R.,[PI]** Banks-Sills, L.[PI] and Eliasy, R.[C] (2003). Stress and strain distribution in the intact canine femur: Finite element analysis. Med. Eng. Phys. 25:387-95. 0.949;26/40;10.

17. **Shahar, R.,**[PI] Banks-Sills, L.[C] and Eliasy, R.[C] (2003). Mechanics of the canine femur with two types of hip replacement stems: finite element analysis. Vet. Comp. Orthop. Traum. 16:145-52. 0.430;73/120;2.

18. Milgram, J.[PI], **Shahar, R.**[PI], Levin-Harrus T.[C] and Kass, P.[C] (2004). The effect of short high intensity magnetic field pulses on the healing of skin wounds in rats. J. Bioelectromagnetics. 25:271-77. 1.526;18/65;7.

19. Shani, J.,[PI] Johnston, D.E.[C] and **Shahar, R.**[PI] (2004). Stabilization of traumatic coxofemoral luxation with an extra-capsular suture from the greater trochanter to the origin of the rectus femoris muscle. Vet. Comp. Orthop. Traum. 17:12-16. 0.430;73/120;2.

20. Milgram, J.[PI], Slonim, E.,[T],Kass, P.H.[C] and **Shahar R.**[PI] (2004). A radiographic study of joint angles in standing dogs. Vet. Comp. Orthop. Traum. 17:82-90. 0.430;73/120;2.

21. **Shahar, R.**[PI] and Shani, Y.[C] (2004). Fracture stabilization with type II external fixator vs. type I external fixator with IM pin: finite element analysis. Vet. Comp. Orthop.Traum. 17:91-96. 0.430;73/120;0.

22. Ranen, E.,[PI] Shamir, M.H.,[C] **Shahar, R.**[C] and Johnston, D.E.[C] (2004). Partial esophagectomy with single layer suture pattern as a method of treating esophageal sarcomas in six dogs. Vet Surg. 33:428-434. 1.196;17/120;10.

23. **Shahar, R.**[PI] and Banks-Sills, L.[PI] (2004). A quasistatic three-dimensional, mathematical, three-body segment model of the canine knee. J. Biomech. 37:1849-1859. 2.005;7/42;8.

24. Bar-Am, Y.,[PI], Klement E.[C], Fourman, V.,[C] and **Shahar, R.**[PI] (2004) Mechanical evaluation of two loop-fastening methods for stainless steel wire. Vet. Comp. Orthop. Traum. 17;241-246. 0.430;73/120;0.

25. **Shahar, R.**[PI] and Milgram, J.[PI] (2005). Morphometric and anatomic study of the forelimb of the dog. J. Morph. 263: 107-117. 1.629;7/17;2.

26. Diamant Idit [PI], **Shahar R** [PI], and Gefen A., [PI] (2005). How to select the elastic modulus for cancellous bone in patient-specific continuum models of the spine?. Med. Biol. Eng. Comp. 43: 465-472. 0.744; 29/42;3.

27. Merchav, R.,[PI] Feuermann, Y.[PI], Shamay, A,[C], Ranen, E.[C], Stein, U.[C], Johnston, D.E.[C], and **Shahar, R.**[PI] (2005) Expression of relaxin receptor LRG7, canine relaxin, and relaxin-like factor in the pelvic diaphragm musculature of dogs with and without perineal hernia. Vet Surg. 34: 476-481. 1.196;17/120;2.

28. **Shahar, R[PI]**, Milgram, J[C]. (2006). Biomechanics of tibial plateau leveling of the canine cruciate-deficient stifle joint: a theoretical model. Vet Surg. 35: 144-149. 1.196;17/120;6.

29. Joseph, R.[PI], Milgram, J.[PI], Zhan, K.[C], **Shahar, R.[PI]** (2006). In vitro study of the ilial anatomic landmarks for safe implant insertion in the first sacral vertebra of the intact canine sacroiliac joint. Vet Surg 35: 510-517, 2006. 1.196;17/120;4.

30. Shani, Y.[PI], Yeshurun, Y. [C] and **Shahar, R.[PI]** (2006). Arthrodesis of the tarsometatarsal joint, using type II ESF with Acrylic connecting bars in four dogs. Vet. Comp. Orthop. Traum. 19: 61-63. 0.430;73/120;3.

31. Sharir, A.[PI], Milgram. J.[C], and **Shahar, R.[PI].** (2006). Structural and functional anatomy of the neck musculature of the dog (Canis familiaris). J. Anat. 208: 331-351. 2.390;4/17;3.

32. Zaslansky, P.[PI], **Shahar, R.[PI]**, Friesem, AA[C] and Weiner, S.[PI] (2006). Relations between shape, materials properties, and function in biological materials using laser speckle interferometry: In situ tooth deformation. Adv. Funct. Mater. 16: 1925-1936. 5.679;7/189; 4.

33. **Shahar, R.[PI],** Zaslanski, P. [PI], Barak, M.[PI], Friesem, A.A.[C], Currey, J.D.[C] and. Weiner, S.[PI] (2006). Anisotropic Poisson's ratio and compression modulus of cortical bone determined by speckle interferometry. J. Biomech. 40: 252-264. 2.897;6/44; 8.

34. Bark, H[PI], **Shahar, R.,[PI]** (2006). The Use of the Objective, Structured Clinical Examination (OSCE) in Small Animal Internal Medicine and Surgery.: J. Vet. Med. Ed. (invited paper). 33:588-92. 1.138;20/120;0

35. **Shahar, R.,[PI]** Bark, H[PI] (2006). Veterinary education in Israel. J. Vet. Med. Ed. (invited paper). 33:233-7. 1.138;20/120;0**.**

36. Diamant, I. [PI], **Shahar, R.** [PI], Masharawi, Y,[PI] and Gefen, A. [PI] (2007). A Method for Patient-Specific Evaluation of Vertebral Cancellous Bone Strength: In Vitro Validation. Clinical Biomechanics. 22: 282-293; 1.505;17/41; 3.

37. **Shahar, R**.[PI] and Weiner, S[PI]. (2007). Insights into whole bone and tooth function using optical metrology. J. Mater. Sci. 42: 8919-8933; 1.081;84/190; 2.

38. Harel, Y.[S], **Shahar, R.[C]** Wolf, S[PI]. (2007). Specific role of LeMAN2 in the control of seed germination exposed by overexpression of the LeMAN3 gene in tomato plants. Planta. 227; 199-209; 3.058;17/147; 0.

39. Sharir, A.[S], Barak, M.M.[S], **Shahar, R[PI]. (**2007). Whole bone mechanics and mechanical testing. The Vet J. 177: 8-17. 1.755;13/133;1. (Review).

40. Barak, M.M.[S], Currey, J.D.[PI], Weiner, S.[C], **Shahar, R[PI].** (2008) Are tensile and compressive Young's moduli of compact bone different? J. Mech. Behavior Biomed. Mater. 2:51-60.

41. Benzioni, H.[PI], **Shahar, R.[C]**, Yudelevitch, S.[C], Milgram, J.[PI]. (2008) Bacterial infective arthritis of the coxofemoral joint in dogs with hip dysplasia. Vet. Comp. Orthop. Traum. 21: 262-6. 0.777; 54/133; 0.

42. * Barak, M.M.[S], Weiner, S.[PI], **Shahar, R[PI]**. (2008) Importance of the Integrity of Trabecular Bone to the Relationship between Load and Deformation of Rat Femora: An Optical Metrology Study. J. Mater Chem. 18: 3855-64. 4.339;10/190; 0.

43. *Reich, A.[S], Sharir, A.[S], Zelzer, E.[C], Hacker, L.[S], Monsonego-Ornan, E.[PI], **Shahar, R[PI]**. (2008) The effect of weight loading and subsequent unloading on the post-natal skeleton. Bone. 43:766-74. 3.966; 9/92; 0.

44. Benzioni, H.[PI], Yudelevich, S.[C], **Shahar, R.[C],** Milgram, J[PI]. (2008) Lateral thoracic artery axial pattern flaps in cats. Vet. Surg. 38:112-6. 1.432; 24/133; 0.

45. * Krauss, S.[S], Monsonego-Ornan, E.[C], Zelzer, E.[C], Fratzl, P.[PI], **Shahar, R[PI]**. (2009) Mechanical function of a complex three-dimensional suture joining the bony elements in the shell of the red-eared slider turtle. Adv. Mater. 21: 407–12. 8.191; 6/190; 0.

46. Barak, M.M.[S], Sharir, A.[S], **Shahar, R[PI].** (2009). Optical metrology methods for mechanical testing of whole bones. The Vet J. 180:7-14. 1.755;13/133; 0. (Review).

47. Lev-Tov Chatach, N.[PI], **Shahar, R.[PI],** Weiner, S[PI]. (2009) Design Strategy of Minipig Molars Using Electronic Speckle Pattern Interferometry (ESPI): Comparison of Deformation under Load between the Tooth-Mandible Complex and the Isolated Tooth. Adv. Mater. 21:413-21. 8.191; 6/190; 0.

48. Amit, T.[S], Gomberg, B.R.[C], Milgram, J.[PI], **Shahar, R[PI]**. (2009). Segmental inertial properties in dogs determined by magnetic resonance imaging. The Vet J. (In press) 1.755;13/133; 0.

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49. Lev Tov-Chatach, N.[PI], Sharir, A.[CI], Weiner, S.[PI], and **Shahar, R.**[PI]. (2009). Determining the elastic modulus of mouse cortical bone using electronic speckle pattern interferometry (ESPI) and micro computed tomography: A new approach for characterizing small-bone material properties. Bone 45: 84-90. 3.966; 9/92; 0.

50. Barak, M.M.[S], Geiger, S.[C], Chattah, N.[PI], **Shahar, R**.[PI], Weiner, S[PI]. (2009). Enamel dictates whole tooth deformation: a finite element model study validated by an optical method. J. Struc. Biol. 168: 511-520. 4.059.

51. Shipov, A.[PI], Sharir, A.[PI], Milgram, J.[C], Monsonego-Ornan, E.[PI], **Shahar, R**.[PI] (2010). The influence of severe and prolonged exercise restriction on the mechanical and structural properties of bone: an avian model. The Vet J 183: 153-160.

52. Barak, M.M.[PI], Weiner, S.[PI], **Shahar, R**.[PI] (2010). The contribution of trabecular bone to the stiffness and strength of rat lumbar vertebrae. Spine. 35: E1153-E1159. 2.62

53. Kreschnizky, M.[PI],Wagermaier, W., Roschger, P.[C], Seto, J.[C], **Shahar, R**.[C], Duda, G.N.[C]; Mundlos, S.[C], Peter Fratzl, P[PI]. (2010) The organization of the osteocyte network mirrors the extracellular matrix orientation in bone. J. Struc. Biol. 173: 303-311. 3.67

54. Bar-El Dadon S.[PI], **Shahar**, **R**.[PU], Katalan, K.[C], Monsonego-Ornan, E.PI, Reifen, R.[PI] (2010) Leptin administration affects growth and skeletal development in a rat intrauterine growth restriction model. Nutrition 27: 973-977. 2.60

55. Lev Tov-Chattah, N., Kupczik, K, **Shahar, R**., Hublin, J.J, Weiner. (2011). Structure-function relations of primate lower incisors: a study of the deformation of Macaca mulatta dentition using electronic speckle pattern interferometry (ESPI). J. Anat. 218: 87-95. 2.13

56. Idelevich, A.[PI], Kerschnitzki, M.[PI], **Shahar, R**.[PI], Monsonego Ornan, E.[PI] (2011). 1,25(OH)2D3 alters growth plate maturation and bone architecture in young rats with normal renal function. PLOS One 6: e20772. 4.09

57. Sharir, A.[PI], Stern, T.[PI], Rot, C[C]., **Shahar, R**.[PI*], Zelzer, E.[PI] (2011) Muscle force regulates bone shaping for optimal load-bearing capacity during embryogenesis. Development 138: 3247-3259. 7.19

58. **Shahar, R**., Lucas, C., Papo, S., Dunlop J. W.C., Weinkamer, R. (2011). Characterization of the spatial arrangement of secondary osteons in the diaphysis of equine and canine long bones. Anatomical Record. 294:1093-1102. 1.49

59. Sharir, A.[PI,] Israeli, D[C]., Milgram, J.[C], Monsonego-Ornan, E.[C], Currey, J.D.[C], **Shahar, R[PI]**. (2011). The canine baculum: the structure and mechanical properties of an unusual bone. Journal of Structural Biology. 175: 451-456. 3.67

60. Jimenez-Palomar, I., Shipov, A., **Shahar, R**., Barber, A. (2012). Influence of SEM vacuum on bone micromechanics using in situ AFM. J. Mech. Behavior Biomed. Mater. 5: 149-155. ?

61. Naveh, G., **Shahar, R.**, Brumfeld, V., Weiner, S. (2012) Tooth Movements are Guided by Specific Contact Areas Between the Tooth Root and the Jaw Bone: a 3D Micro-CT Study of the Rat Molar. Journal of Structural Biology. 177: 477-483. 3.67.

62. Torchinsky, A., Mizrahi, L., Savion, S., **Shahar, R.,** Toder, V., Kobyliansky, E. (2012). Bone loss in adult offspring induced by low-dose exposure to teratogens. J. Bone Miner. Metab. DOI: 10.1007/s00774-011-0311-7. 1.89.

63. Cohen, L., Dean, M., Shipov, A., Atkins, A., Monsonego-Ornan, E., **Shahar, R**. (2012). Comparison of structural, architectural and mechanical aspects of cellular and acellular bone in two teleost fish. Journal of Experimental Biology. 215: 1983-1993. 2.72.

64. Dean, M., **Shahar, R**. (2012). The structure-mechanics relationship and the response to load of the acellular bone of neoteleost fish: a review. Journal of Applied Ichthyology. 28: 320-329.

65. Amosi, N., Zarzhitsky, S., Gilshon, E., Salnikov, O., Monsonego-Ornan, E., **Shahar, R.,** Rapaport, H. (2012). Acidic peptide hydrogel scaffolds enhance calcium phosphate mineral turnover into bone tissue. Acta Biomaterialia. 8: 2466-2475. 3.98.

66. Yair, R., Uni, Z., **Shahar, R.** (2012). Bone characteristics of late term embryonic and hatchling broilers: Bone development under extreme growth rate. Poultry Science. 91: 2614-2620.

67. Sharir, A., Zelzer, E., Shahar, R. (2013). A temporary decrease in mineral density in perinatal mouse long bones. Bone. DOI: 10.1016/J.bone.2012.09.032.

68. Naveh G., Lev Tov Chattah, N., Zaslansky, P., Shahar, R., Weiner, R. (2012). Tooth-PDL-bone complex: response to compressive loads encountered during mastication – a review. Archives of oral biology. Accepted for publication.

69. Naveh G., Lev Tov Chattah, N., Zaslansky, P., **Shahar, R**., Weiner, R. (2012). Tooth-PDL-bone complex: response to compressive loads encountered during mastication – a review. Archives of oral biology. 12: 1575-1584.

70. Reznikov, N., Magal, R., **Shahar, R.,** Weiner, S. (2012) Lamellar Bone Micro-Structure: 3D Electron Microscope Analysis Using Serial Surface View Reveals a Novel Disordered Sub-Structure. Accepted for publication, Bone.

71. Yair, R., **Shahar, R.,** Uni, Z. (2012). Prenatal nutritional manipulation by in ovo enrichment influences bone structure, composition and mechanical properties. Submitted: Animal science.

72. Shipov, A., Zaslansky, P., Shahar, R*. (2012). Cortical bone of rats. J. Struc. Biol.

73. Currey, J, Shahar R. (2012) Cavities in bone. J. Struc. Biol.

74. Mason review, J. Exp Biol

75. Efrat and Galya Bone

76. Stav interleukins ?????

* Corresponding author

Case reports

1. **Shahar, R.**[PI] Rousseaux, C.,[C] and Steiss, J. [C] (1985). Peripheral polyneuropathy in a dog with functional islet B-cell tumor and wide spread metastasis. J. Am. Vet. Med. Assoc. 187:175-7. 1.404;11/120;17; 18.

2. Harrus, S.,[PI] Waner, T.,[C] **Shahar, R.**[C] and Nyska, A.[C] (1994). Jejunal acinar type adenocarcinoma in a dog. Canine Practice, 19:17-20. journal does not appear in the citation index
3. **Shahar, R.,**[PI] Horowitz, I.H.[C] and Aizenberg, I.[C] (1995). Disseminated hydatidosis in a ring-tailed lemur (Lemur catta): A case report. J. Zoo Wildlife Med. 26:324-326. 0.168;100/120;0.

4. Shamir, M.H.[PI] and **Shahar, R.**[PI] (1996). Extrauterine fetuses in an asymptomatic dog. Canine Practice. 21:25-7. journal does not appear in the citation index

5. Shamir, M.H.,[PI] **Shahar, R.**[C] and Aizenberg, Z.[C] (1997). Sub Arachnoid cyst in a cat: A case report. J. Am. Anim. Hosp. Assoc. 33:123-5. 1.052;25/120;11.

6. **Shahar, R.,**[PI] Harrus, S.[C] and Yacobson, B.[C] (1998). Mesenteric vein thrombosis in a dog. J. Am. Anim. Hosp. Assoc. 34:431-3. 1.052; 25/120;0.

7. Shani, Y.[PI] and **Shahar, R.[PI]**. (2000). Repair of chronic complete traumatic rupture of the common calcaneal tendon in a dog, using a fascia lata graft. Case report and literature review. Vet. Comp. Orthop. Traum. 13:104-8. 0.777;73/120; 9.

8. Merchav, R.,[PI] Dank G.[C], Aizenberg Z.,[C] and **Shahar, R.[PI]** (2005) Chondrosarcoma of the proximal humerus in a cat. J. Sm. An. Prac. 46: 454-6. 0.768;40/120;0.

9. Bar-Am, Y.,[PI] Anug, AM.,[C] and **Shahar, R.[PI]** (2006) Femoral compartment syndrome due to haemangiosarcoma in the semimembranosus muscle in a dog. J. Sm. An. Prac. 47: 286-9. 0.768;40/120;0.

10. Shipov, A.[PI], **Shahar, R**.[C], Milgram, J.[PI]. (2008) Successful management of bilateral pattelar tendon rupture in a dog. Vet Comp Orth Trau. 21: 181-4. 0.777;54/133;0.

Other articles

1. Zaslanski, P. [PI]**, Shahar, R.[PI]**, Barak, M.[PI], Friesem, A.A.[C], and. Weiner, S.[PI] (2006). Tooth and bone deformation: structure and material – properties by ESPI. Proc. SPIE 6341, 634109.

6. Participation in Scientific Conferences, Lectures and Other activity:

1. Shamir, M.H., **Shahar, R.** and Johnston, D.E. Semirigid external fixation for repair of fractures in young animals. Proceedings of the 4th ECVS annual scientific meeting, 1995 (Abstract).
2. **Shahar, R.**, Shamir, M.H., Niebauer, G.W. and Johnston, D.E. A possible association between acquired non-traumatic inguinal and perineal hernia in adult male dogs. Proceedings of the 4th ECVS annual scientific meeting, 1995 (**Lecture** and Abstract).
3. **Shahar, R**, Shamir, M.H. and Johnston, D.E.: A technique for management of bite wounds of the thoracic wall in small dogs. Proceedings of the 5th ECVS annual scientific meeting, 1996 (**Lecture** and Abstract).
4. Shamir, M.H., **Shahar, R**. and Johnston DE: Approaches to esophageal sutures. Proceedings of the 5th ECVS annual scientific meeting, 1996 (Abstract).
5. **Shahar, R**. and Danieli, A. In-vivo QUS Measurements at the mid-tibia and mid-radius of dogs. Poster at the annual society of bone and mineral research, 1998. San Francisco, USA. (Abstract)
6. **Shahar, R.** Rigidity and stress analyses of type I and type II external fixators with acrylic connecting bars – a theoretical approach. Proceedings of the 8th ECVS annual scientific meeting, 1999 (**Lecture**).
7. **Shahar, R.**, Banks-Sills L. and Eliasi, R. Strain distribution in the intact canine femur: finite element analysis. Proceedings of the 36th ACVS Annual Scientific Meeting, Chicago, U.S.A. , 2001 (**Lecture**).

8. **Shahar, R**. Biomechanical Analysis of the TPLO technique. Proceedings of the 1st World orthopedic veterinary congress, Munich, Germany, 2002 (**Invited lecture**).
9. **Shahar, R.** Finite element analysis of the Zurich and Biomechanique prostheses. Proceedings of the 1st World orthopedic veterinary congress, Munich, Germany, 2002 (**Invited lecture**).
10. **Shahar, R.** Evaluation of external fixator frames by finite element analysis. Proceedings of the 12th ECVS annual scientific meeting, Vienna, Austria, 2003 (**Invited Lecture**).
11. Shani, J., Johnston, D.E., **Shahar, R.** Stabilization of traumatic coxofemoral luxations in dogs and cats, using extra-capsular suture between the origin of the rectus femoris muscle and the greater trochanter. Proceedings of the 13th ECVS annual scientific meeting, Prague, Czech Republic, 2004 (**Student presented lecture**).
12. Shani, J., **Shahar, R.** Arthrodesis of the tarso-metatarsal joint in dogs, using type 2 ESF with acrylic connecting bars in four dogs. 13th ECVS annual scientific meeting, Prague, Czech Republic, 2004 (**poster**).
13. **Shahar, R.**, Weiner, S., Friesem, A., Zaslansky, P. A novel method for determining the elastic properties of cortical bone using optical metrology. Proceedings of the 2nd World Orthopedic Veterinary Congress, Munich, Germany, 2004 (**Invited lecture**).
14. **Shahar, R.** Biomechanics of the intact knee before and after oseotomies. Proceedings of the 14th ECVS annual scientific meeting, Lyon, France, 2005. (**Invited lecture**)
15. **Shahar, R.**, Weiner, S., Friesem, A., Zaslansky, P. A novel method for determining the elastic properties of cortical bone using optical metrology. 30th Israeli Conference on Mechanical Engineering. Tel-Aviv, Israel, 2005 (**Invited lecture**)
16. **Shahar, R**. Theoretical Modeling in Clinical Biomechanics. Weizmann Institute of Science, Rehovot, Israel. 2005. (**Seminar)**
17. Barak, M.M., **Shahar, R.,** Zaslansky, P., Friesem, A.A., Currey, J.J., Weiner, S. Anisotropic Poisson's ratio and compression modulus of cortical bone determined by speckle interferometry. 12th international workshop on stem cells and calcified tissues, Herzeliya, Israel, 2006 (**student presented lecture**).
18. **Shahar, R.,** Barak, M.M., Zaslansky, P., Friesem, A.A., Currey, J.J., Weiner, S. Anisotropic Poisson's ratio and compression modulus of cortical bone determined by speckle interferometry. World Congress of Biomechanics, Munich, Germany, 2006 **(lecture)**
19. Barak, M.M., Weiner, S, **Shahar, R.** The contribution of cancellous bone to the mechanical performance of whole bone. European society of biomechanics, Lucerne, Switzerland, 2008 (**student presented lecture**).
20. Shahar fish Portugal 2010 presented
21. Shahar fish 2012 Lisbon presented
22. Shipov rat Lisbon student presentation
23. Atkins Gordon 2012 fish abstract

Patents: none

SCIENTIFIC BIOGRAPHY

Basic Clinical Research

The main focus of my research activity is the study of bone structure and function, in the basic sense. The methods I use are based on the unique blend of my post-graduate engineering education (B.Sc, M.Sc and Ph.D degrees in bio-mechanical engineering) combined with my veterinary education and specialization in clinical orthopedic surgery. This background allows me to be involved in basic research in the field of biomechanics in all its aspects (theoretical and experimental), and in particular to make pioneering contributions in this area to the veterinary field, which is much less developed than its human counterpart. Most of my publications are the result of my own work, or collaborative work which I lead. In my research I have made several significant contributions to the discipline of veterinary biomechanics in two main areas:

a. Application of advanced numerical methods to study the performance of implants and fracture repair methods used in orthopedics, both human and veterinary.

I have published several papers that employ finite element analysis to analyze and compare the performance of different external fixator systems (articles # 10, 11, 21). I have used the same technique to evaluate the stress and strain distribution in the intact canine femur, and showed that although most orthopedic textbooks propose simplistically that the femur is loaded in bending, in fact when all muscle forces are considered the femur undergoes almost pure compression (article # 16). In another paper I reported an analysis that compared between two types of commonly used canine hip implants using finite element analysis (article # 17). Such analyses have not been previously applied to questions relevant to veterinary orthopedics.

b. Theoretical mathematical models of forces in muscles and joints of the dog.

Muscle forces and joint reaction forces cannot be measured experimentally. Although the discipline of mathematical modeling of body segments is advanced and frequently applied in human biomechanics, no publications appeared previously in the veterinary literature. I applied this method to determine the forces in the joints and muscles of the canine hind leg (article # 15), and published in the Journal of Biomechanics a three-dimensional mathematical model of the canine knee whose complexity exceeds previously published models of the human knee (reference # 23). This model allows the determination of the forces in the various knee ligaments at different times during the gait. This model forms the basis of several studies in progress at this time, which objectively and accurately evaluate and compare different surgical techniques such as repair of the torn anterior cruciate ligament, patellar luxation, etc.

Future Research plans - clinical biomechanics

My biomechanics laboratory, situated in the campus of the Faculty of Agricultural, Food and Environmental Quality Sciences, is based on cadaveric studies using custom-built jigs that allow precise and controlled study of the loading and motion of joints. The lab is also equipped with the latest model of the Nest of Birds^{TM}, an extremely precise electromagnetic motion tracking

system. In my laboratory my group is investigating experimentally the physiologic and pathologic characteristics of the motion/stability of several canine joints, which include the knee, elbow, tarsus, metatarsus and cervical spine. These experiments will form the basis for the development of several mathematical models describing the static and dynamic forces developing in the canine in various joints and in the muscles surrounding those joints. Joints being modeled include the canine neck region and the canine front leg, while another group of studies uses the canine knee model to evaluate common surgical procedures such as TPLO and patellar luxation.

Another study underway will determine the inertial properties of various canine body segments, which are essential for the development of dynamic models. This information has not been published in the veterinary literature.

Another area I am involved in is the study of the bio-mechanical performance of human dental implants and human orthodontics. This project involves concepts of clinical orthodontics and biomechanics, in particular numerical computerized calculations of displacements, stresses and strains in dental implants and in the bone which surrounds them.

Basic research

During the last 6 years I have developed a new area of research – the structure and mechanical function of bones, and the inter-relationship between them. I have formed collaboration with a group of researchers in the departments of structural biology and molecular genetics at the Weizmann Institute, performing advanced and cutting-edge basic research on the relationship between bone structure and mechanical function, and on bone development. This multi-disciplinary area of research requires cooperation between biologists and bio-mechanical engineers, and while my main contribution is in the latter aspects, my training as a veterinarian and specialist in orthopedics (dealing with bones routinely on a clinical level), enables me to easily bridge the gap between both disciplines. I spent a sabbatical year (2004) at the Weizmann Institute performing basic research on bone and its mechanical function, with Professor Steve Weiner. Prof. Weiner is one of the leading researchers in the field of bone research in the world today. Together we are conducting long-term research on the elastic properties of cortical bone in the meso-scale (micron to millimeter) with state-of-the-art experimental techniques. In particular, we have put together a testing system which is based on a custom-built mechanical loading device and a speckle interferometry system. Speckle interferometry is a novel optical method which allows extremely accurate non-contact determination of displacements in loaded bodies. While speckle interferometry has been used for various engineering purposes over the last few years, it has not been applied so far to bone biomechanics. We also study the mechanics of micro-cracking and fracture in cortical bone, a subject of vast importance and intensive research due to its relationship to osteoporosis and stress fractures. The team also includes 2 PhD students, one of which (Meir Barak) is supervised jointly by Prof. Weiner and myself, and the other (Amnon Sharir) is supervised by Dr. Eli Zelzer and myself (molecular genetics, Weizmann Institute). Our collaborative work has resulted in several publications – articles # 32, 33, 35, 37, 40, 42, 43, 45, 47).

In the course of my research activity in this area I formed strong research collaboration with several groups such as the group led by Professor Peter Fratzl of the Max-Planck institute in Golm, Germany, Professor John Currey of York University in the UK and Professor Osten of the University of Stuttgart, in Germany. All collaborations deal with basic bone research. I also started to collaborate with several other groups in Israel, notably Professor Zohar Yosibash of the department of mechanical engineering at Ben Gurion University.