

SYLLABUS

CDS 612 - CHILD GROWTH AND DEVELOPMENT, PART II

COURSE DIRECTOR: DR. CYNTHIA S. BEEMAN

COURSE DESCRIPTION

This course introduces the basic concepts of developmental biology and the more complex issues surrounding developmental craniofacial biology. Topics relating to the cell and molecular mechanisms which direct growth and development will be presented. The second half of the course will apply these principals to clinical issues related to growth and development. Mechanisms which control facial growth at adolescence, adult growth and maturational changes will be discussed.

COURSE OBJECTIVES

Students will demonstrate understanding of the basic principles of developmental biology and the importance of these concepts to the etiology of craniofacial deformities and malocclusions. An understanding of the cell and molecular mechanisms of growth and development will enhance the students' ability to interpret basic and applied orthodontics research. Current and future orthodontic treatment modalities are combining traditional biomechanics with pharmaceutical, electromagnetic, and molecular genetic approaches in an effort to improve orthodontic treatment outcomes. Students should be aware of the current understanding of growth and development in its entirety--from gamete to maturity and from the molecular level to that of the whole human organism.

COURSE EVALUATION

Performance will be based on student preparedness for seminar discussions. Consistent excellent seminar preparation and participation will earn an Honors grade. Acceptable performance will earn a Pass grade. Students are expected to abide by the College Honor Code standards.

COURSE SCHEDULE
CDS 612

DIRECTOR: DR. CYNTHIA S. BEEMAN
CDS 612: CHILD GROWTH AND DEVELOPMENT, PART II
SECOND YEAR STUDENTS

<u>SESSION</u>	<u>TOPIC</u>	<u>LECTURER</u>
1	Introduction to Developmental Biology	Dr. Beeman
2	Introduction to Tissue Interactions	Dr. Beeman
3	Molecular and Genetic Control of Development	Dr. Beeman
4	Molecular/Genetic Mechanisms of Tooth Development	Dr. Beeman
5	Patterning during Morphogenesis: Development of the Palate, Mandible and Teeth	Dr. Beeman
6	Endocrinology and Orthodontics	Dr. Beeman
7	Soft Tissue Growth (Soft tissue analysis growth predictions) and Growth predictions	Dr. Beeman
8	Neurological, Behavioral and Psychological Development (ADHD)	Dr. Beeman
9	Odontogenesis, Disruption of Odontogenesis, and Relationship of Tooth Morphology and Position to Skeletal Pattern and Canine Impaction and Eruption Mechanisms	Dr. Beeman
10	Adult Growth	Dr. Beeman

CDS 612
COURSE OUTLINE AND READING ASSIGNMENTS

SESSION 1 INTRODUCTION TO DEVELOPMENTAL BIOLOGY

In Developmental Biology (S. Gilbert): reading from Chapters 1, 4, 5

SESSION 2 INTRODUCTION TO TISSUE INTERACTIONS

In Developmental Biology (S. Gilbert): reading from Chapters 6 and 8.

SESSION 3 MOLECULAR/GENETIC CONTROL OF DEVELOPMENT

Slavkin, H.C. (1991). Molecular determinants during dental morphogenesis and odontodifferentiation: A review. *J. Cranio. Genet. Dev. Biol.* 11:338-349.

Moore, G., Ivens, A., Chambers, J., Bjornsson, A., Arnason, A., Jensson, O. and Williamson, R. (1988). The application of molecular genetics to detection of craniofacial abnormality. *Development* 103: 233-239.

Moore, G.E., Williamson, R., Jensson, O., Chambers, J., Takakubo, F., Newton, R., Balacs, M.A., Ivens, A. (1991) Localization of a mutant gene for cleft palate and ankyloglossia in an x-linked Icelandic family. *J. Craniofac. Genet. Dev. Biol.* 11: 372-376.

Wright, C.V.E. (1991). Vertebrate Homeobox Genes. *Current Opinion in Cell Biology* 3:976-982.

Ragsdale, C.W. and Brockes, J.P. (1991). Retinoids and their targets in vertebrate development. *Current Opinion in Cell Biology* 3:928-934.

"Homeobox genes and the vertebrate head", Peter Holland, *Development* 103 Supplement (1988) pp. 17-24.

Sharpe, P. T. "Homeobox genes and orofacial development." *Connective Tissue Research* 32: 17-25, 1995.

Slavkin, H.C. "Molecular Biology Experimental Strategies for Craniofacial-Oral-Dental Dysmorphology". *Connective Tissue Research* 32:233-239, 1995.

**SESSION 4 MOLECULAR AND GENETIC MECHANISMS IN
 TOOTH DEVELOPMENT**

Vainio, S. et al (1991). Expression of syndecan gene is induced early, is transient and correlates with changes in mesenchymal cell proliferation during tooth development. *Dev Biol* 147:322-333.

Kronmiller, J.E. et al (1991). EGF antisense oligodeoxy nucleotides block murine odontogenesis. *Dev Biol* 147:485-488.

Kronmiller, J.E. et al (1992). Alteration of murine odontogenic patterning and prolongation of expression of epidermal growth factor mRNA by retinol in vitro. Arch Oral Biol 37:129-138.

Beeman CS and Kronmiller JE: (1994) Temporal Distribution of Endogenous Retinoids in Embryonic Murine Mandibles and Tongue. Arch Oral Biol 30(12): 1071-1078

Beeman C, Kronmiller JE (1995) Spatial Distribution of Endogenous 9-cis Retinoic Acid. J. Dent. Res., 74: 147

Kronmiller JE and Beeman CS (1994a) Retinoic Acid May Instruct Incisor Morphology in Embryonic Murine Mandibles. J. Dent. Res., 73: 175

Kronmiller JE and Beeman CB (1994b) Spatial distribution of endogenous retinoids in the murine embryonic mandible. Arch Oral Biol. 39(12): 1071-1078

Kronmiller JE, Beeman CS, Kwiecien K and Rollins T (1994) Effects of the Intermediate Retinoid Metabolite Retinol on the Pattern of the Dental Lamina in Vitro. Arch Oral Biol 39(10) 839-845

Kronmiller JE and Beeman CS (1995) Blockade of the Initiation of Odontogenesis In Vitro by Citral, An Inhibitor of Endogenous Retinoic Acid Synthesis. Arch Oral Biol 40 (7): 645-652

Seow WK, Urban S, Vafaie N and Shusterman S (1998) Morphometric Analysis of the Primary and Permanent Dentitions in Hemifacial Micosomia: A Controlled Study J Dent Res: 77(1) 27-38

Vastardis, H., Karimbux, N., Symon, W.G., Seidman, J.G., Seidman, C.E.: A human MSX-1 homeodomain missense mutation causes selective tooth agenesis. Nat. Genet. 13: 417-421, 1996.

SESSION 5 PATTERNING DURING MORPHOGENESIS: DEVELOPMENT OF THE PALATE AND MANDIBLE

S.E. Wedden, J.R. Ralphs and C. Tickle, (1988) Pattern formation in the facial primordia. Development 103 Supplement: 31-40.

Ferguson, M.W.J., (1988) Palate development. Development 103 Supplement: 41-60.)

Fitchett, J.E. and Hay, E.D. (1989) Medial edge epithelium transforms to mesenchyme after embryonic palatal shelves fuse. Developmental Biology 131: 455-474.

Mina, M. and Kollar, E.J. (1991). Role of early epithelium in the patterning of the teeth and Meckel's cartilage. J Craniofac Genet Dev Biol 11:223-228.

SESSION 6 ENDOCRINOLOGY AND ORTHODONTICS

Laino, A. and Melsen, B. (1997) "Orthodontics treatment of a patient with multidisciplinary problems", Am J Orthod Dentofac Orthop , 111:141-8.

Povolny, B. (1994) "Commentary: Thyroid function and root resorption", Angle Orthodontist Vol. 64(5), p394.

Risinger, R. and Proffit, W. (1996) "Continuous Overnight Observation of Human Premolar Eruption", Archs oral Biol. Vo1 41 (8/9), pp. 779-789.

Reuland-Bosma, W. and Dibbets, J. (1991) "Mandibular and dental development subsequent to thyroid therapy in a boy with Down syndrome: report of case" J. Dentistry for Children, pp. 64-68.

Newman, G. and Newman R. (1994) "A longitudinal study of the effects of surgery, radiation, growth hormone, and orthodontic therapy on the craniofacial skeleton of a patient evidencing hypopituitarism and a Class II malocclusion: Report of a case" Vol. 106(6): 571-582.

Poumpros, E., Loberg, E. and Engstrom, C. (1994) "Thyroid function and root resorption" Angle orthod 64(5): 389-394

Loberg, E. and Engstrom, C. (1994) "Thyroid administration to reduce root resorption" Angle orthod 64(5): 395-400.

SESSION 7 SOFT TISSUE GROWTH (SOFT TISSUE ANALYSIS GROWTH PREDICTIONS) AND GROWTH PREDICTIONS

Handouts

SESSION 8 NEUROLOGICAL, BEHAVIORAL AND PSYCHOLOGICAL DEVELOPMENT (ADHD)

SESSIONS 9 ODONTOGENESIS, DISRUPTION OF ODONTOGENESIS, CANINE IMPACTION AND ERUPTION MECHANISMS

*Serra, M., Evans, C (1999) Orthodontic Management of Hypodontia, Delayed Eruption and Mandibular Skeletal Asymmetry. Case Studies in Orthodontics, Volume II(3).

*Lidral, A., Shanker, S., Joo, B-H., Vig, K. Non-surgical Treatment of a Skeletal Class III Malocclusion Associated with Impacted Maxillary Canines, Oligodontia and Microdontia: A Case Report. Case Studies in Orthodontics, Volume I(4).

*Bishara S: Impacted maxillary canines: A review. Am J. Orthod. Dentofacial Orthop. 101:159-171. 1992

Ito, R.K., Vig, K.W.L. Garn. S.M., Hopwood, N.J., Loos, P.J. Spalding, P.M., Deputy, B.S., Hoard, B.C.: The influence of growth hormone (rhGH) therapy on tooth formation in idiopathic short statured children. Am.J. Orthod. Dentofacial. Orthop. 103: 358-364, 1993.

LeBot, P., Salmon, D: Congenital defects of the upper lateral incisors (ULI): condition and measurements of the other teeth, measurements of the superior arch, head and face. Am.J. Phys. Anthropol. 46: 231-244, 1977.

Marks, S.C., Jr., Cahill, D.R.: Regional control by the dental follicle of alterations in alveolar bone metabolism during tooth eruption. *J. Oral Pathol.* 16: 164-169, 1987.

*Marks, S.C., Jr., Schroeder, H.E.: Tooth eruption: theories and facts. *Anat. Rec.* 245: 374-393, 1996

*Peck, S., Peck, L., Kataja, M.: Site-specificity of tooth agenesis in subjects with maxillary canine malpositions. *Angle Orthod.* 66: 473-476, 1996.

Jacobs, S.G.: Palatally impacted canines: Aetiology of impaction and the scope for interception. Report of cases outside the guidelines for interception. *Aust. Dent. J.* (39)4: 206-211, 1994.

*Pirinen, S., Arte, S., Apajalahti, S: Palatal displacement of canine is genetic and related to the congenital absence of teeth. *J.Dent. Res.* 75(10): 1742-1746, 1996.

"Homeobox genes and the vertebrate head", Peter Holland, *Development* 103 Supplement (1988) pp. 17-24.

Sharpe, P. T. "Homeobox genes and orofacial development." *Connective Tissue Research* 32: 17-25, 1995.

Slavkin, H.C. "Molecular Biology Experimental Strategies for Craniofacial-Oral-Dental Dymorphology". *Connective Tissue Research* 32:233-239, 1995.

SESSION 10 ADULT GROWTH

Behrents, R.G. (1985). Growth of the aging craniofacial skeleton. Monograph 17, Craniofacial Growth Series, Center for Human Growth and Development, U. of Michigan.

Behrents, R.G. (1985). An atlas of growth in the aging craniofacial skeleton. Monograph 18, Craniofacial Growth Series, Center for Human Growth and Development, U. of Michigan.