INTEGRATING 20TH CENTURY BASIC SCIENCE INTO A 21ST CENTURY DENTAL SCHOOL CURRICULUM

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Situation in 2010

- Since circa 1950, the amount of new scientific information, especially in the biosciences, has exceeded the amount of time allocated in dental curriculum for basic science teaching.
Problem

Find curriculum time to accommodate the additional bioscience discoveries
A Possible Solution

Identify bioscience discoveries in various stages of translation to equipment and products and use these bioscience innovations to illustrate the basic science lectures
Goals of this Talk

- To explain integration program: process for identification, selection, and integration of emerging bioscience technologies into basic science lectures
- Provide some anecdotal stories on the response of students to this integration program
- Despite success of the program, discuss reasons for its failure to result in any curriculum modifications at my dental school
Approaches to Identification of promising bioscience technologies and products

- Surveys
- Focus groups
- Study Club Questionnaires
- Tracking Patents
- Historical Analysis
History as a guide to selection of promising technology

- We examined the translation of basic science discoveries to technology in decade from 1900 to 1910 and compared this to the translation of basic science discoveries in decade from 2000 to 2010.
Two Historical Observations

- Significant scientific discoveries occurred from circa 1850 to 1900 - in 50 yrs preceding 1900

- In decade from 1900 to 1910 new equipment and products emerged directly from these scientific discoveries and accepted, rapidly into dental practice
Examples

- **Discoveries 1850-1900**
  - X-RAYS - ROENGEN
  - ELECTRICITY – FARADAY
  - NITROUS OXIDE – DAVY
  - MICROBIAL BASIS OF DECAY - WD MILLER

- **Translated 1900 -1910**
  - X-RAYS IN DENTSITRY – KELLS
  - IMPROVED DENTAL ENGINE – G.V.BLACK
  - NITROUS OXIDE ANASTHESIA – WELLS
  - GERM THEORY OF DISEASE- WD MILLER
  - FOCAL THEORY OF INFECTION – HUNTER
Effect of Translation on Dental School Curricula

- In decade 1900 to 1910 additional basic sciences courses added to dental curriculum including microbiology, radiology, chemistry and physics of materials.

- In 1923 Gies’s report formally recommended increase in basic science hours and dental school increased from 2 to 4 year.
Some Discoveries from 1950-2000

- DNA AS GENETIC MATERIAL
- DNA STRUCTURE
- SEQUENCE OF HUMAN GEONOME
- STEM CELLS
- BIOSCAFFOLDS FOR REGENERATION
- VACCINES FOR CARIES AND PERIO
- BIOMARKERS IN SALIVA
- GENETIC AND EPIGENETIC THEORY OF DENTAL AND CRANIOFACIAL DISEASES
Translation of science to technology 2000-2010

In the decade from 2000 to 2010, translation of scientific discoveries has not yet produced commercially viable equipment and products.
Conclusion

- Many science discoveries are in developmental pipeline and those in early commercialization are excellent for introduction into basic science lectures
Bioscience technologies introduced into basic science lectures

- Using Saliva for Measurement of Disease Biomarkers Progress in Development of Vaccines for Caries and Periodontal disease
- The Pros/Cons of Non invasive Oral Cancer Screening Technologies
- Storage of Stem Cells from Deciduous Teeth and 3ed Molars – Is This Technology Worth the Expense?
Bioscience technologies introduced into basic science lectures

- Growing (regenerating) enamel, dentin, condyles and other craniofacial structures with stem cells and bioscaffolds
- Biomimetics in Dentistry - making synthetic bone, glass ionomers
- Cytokines as risk factors for periodontal disease
Bioscience technologies introduced into basic science lectures

- Implantable WiFi Transducers for Restoration of Neuronal Functions
- Expanding the Scope of Dental Practice: The Dentists' Role in Treatment of Sleep Apnea
- Voice Recognition for patient management computer interface
Student comments on vaccines for caries

- this research threatened their career and livelihood
- questioned wisdom of the research in this area.
- asked who funded the research
- asked if the ADA was aware of this research
Comments on use of biomarkers in saliva for disease detection including various cancers

Many students expressed the view that dentists should not diagnose cancer – “its not their job”.

- Did not want dentist to be messages of “bad” news
- Thought that visit to dentist should be non-stressful and pleasant experience
- There already was enough fear associated with dental office visit
Comments on harvesting and storage of stem cells

➢ “Are you kidding me? Will people really pay for this service?”
➢ “Does it really work?”
➢ “If you can grow teeth what will happen to the implant business?”
Conclusions

- In 1900 the equipment and products in the dental office created the need to add additional basic science courses. The science courses were added AFTER the equipment.

- In 2010 there is almost no equipment and/or products in the dental office based on the bioscience accumulated since 1950. Thus there is no “pressure” for additional basic science in the curriculum.
An Ideal Bioscience Technology

1. Illustrates utility of the basic science content of the lecture,

2. Demonstrates that utilization of the technology requires understanding of underlying basic science

3. Is controversial and will provoke discussion
Steps for Implementing Educational Program

1. Identify Bioscience Discoveries
2. Review Basic Science Lectures
3. Select Bioscience Discoveries relevant to Lectures
4. Discuss each selection with faculty
5. Survey Students for Linkage of Technology and Science
Rossomando’s 3 Laws for Curriculum Change

- First Law: Policy decisions are dependent on political considerations
- Second Law: Only evolutionary changes should be presented – revolutionary changes won’t even be understood
- Third Law: Evolutionary changes must be presented incrementally – “baby steps” are crucial
Recomendations

- Change in basic science curriculum should be driven by discoveries that have advanced to translation stage – to prototypes or beyond
- Change in clinical dental curriculum should be driven by technology and product in use in dental practice -
For More Information on the 3 Laws and Implementing Curriculum Change at Your School contact Edward Rossomando at info@biodontics.org or visit www.biodontics.org