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Osmosis CATS

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Abstract:

Introductory Biology for Allied Health, Bio 156, is a course many students take for the nursing major. This course teaches a number of concepts that are important and repeated throughout other biology prerequisite courses (Bio 201 Anatomy and Physiology I, Bio 202 Anatomy and Physiology II, and Bio 205 Microbiology), nursing block 1-4 courses, and the NCLEX, nursing certification exam. The purpose of this CATS is to question whether the concepts we teach are retained through the courses. We decided to pick one topic and study this process. Osmosis is a concept that is taught throughout the sequence of courses and program. We made a pre-test and assessed students' understanding of osmosis. The result was surprising, the students in Bio 202 (49%) did slightly worse than Bio 156 (51%). The results have generated useful conversations and initiated changes to our pre-nursing course content/alignment.

What is the Need/Assessment?

Most of our students in Bio 156 and Bio 202 feed into the nursing pathway. We need to make sure that we are preparing the students for success. I teach Bio 202 and I have noticed that when I ask background information on osmosis, students are getting these questions wrong. Through conversations with nursing faculty, we find that the concept of osmosis (fluid and electrolytes) is a concept that nursing students struggle with. The topic of osmosis is studied in Bio 156, and ideas of this topic are repeated in Bio 201, 202, and 205. We started to question why students are not understanding this topic and what can we do about it.

Describe the necessity for this change:

The concept of osmosis and fluids and electrolyte is a critical topic in nursing courses. Fluids and electrolyte is essential for understanding how to maintain blood pressure, deliver IV, preserve bodily functions, and much more. Nurses need to understand this topic to deliver care. The concept of fluids and electrolytes is also on the nursing certification exam (NCLEX). Nursing students need to pass this exam to get board

certified and EMCC need students to pass to accredited our program. This is just one concept, but we are using this topic to assess how much continuity we have within the pre-requisite courses and the nursing pathway.

Describe what will be (or was) implemented to affect change

We created a pre-test (file attached) to assess where the problems in understanding the concept of osmosis may lie. Our pre-test had 8 questions, some were taken from Bio 156, some from Bio 202, and some from NCLEX practice tests. The results show that: Bio 156 scored 51% (n=36) on the pre-test; Bio 202 students scored 49%(n=72) on the pre-test(file attached). The result surprised us. How did students who took more biology classes do worse on the pre-test?

Interpret, compare and describe the results of the change

With the results, we started asking questions and look at how we are teaching the topic. Dr. Parmiter and I compared our class notes and noticed that we are teaching the topic slightly different. We are using different terminology. In physiology and medicine, we use numbers and units of measurements to compare the fluid and electrolytes in osmosis. We discussed this with nursing faculty and found that in they use numbers as well. In general biology, number is not used when comparing the concentration. We also realized that a lot of the misunderstanding comes from students mis-defining the variables and the terminology.

After analyzing the information, what are the next steps?

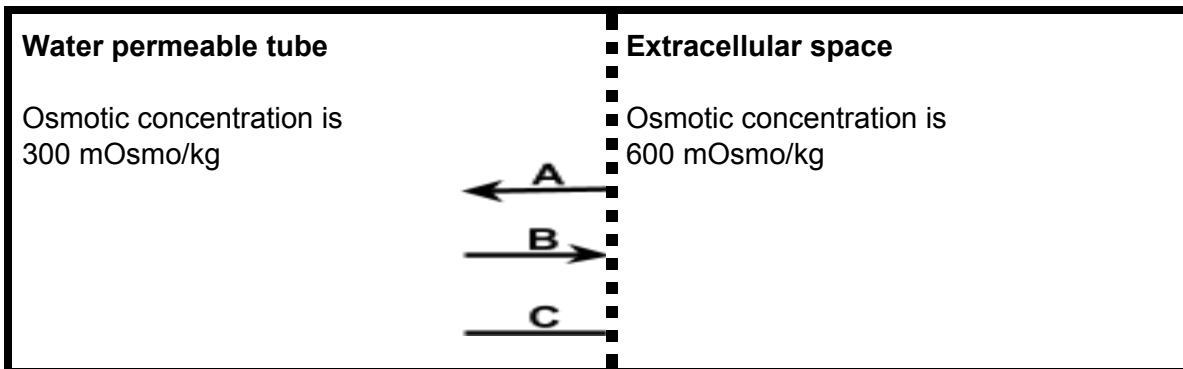
Our next steps are the following:

1. Assess if the understanding of concepts improve after we align our classes better. I have some initial data on an exam question. In previous semesters, the question I ask about osmosis and fluid movement has a score below 30%. This semester I spent some time review the concept using terminology definition and numbers. The result was that the score on that same question improved to 62%. There is still a lot of room for improvement.
2. We will continue to meet with nursing faculty to discuss what topics are problematic in nursing.
3. Dr. Parmiter and I will continue to analyze this process, topic by topic, and align our courses with the nursing pathway.

4. We plan to expand our pre-nursing course alignment, designing modules that better service pre-nursing student learning, and in the process more accurately complement content areas that nursing students tend to find more challenging.

Osmosis Across the Curriculum Pre-test

- _____ fluids remove water from the extracellular space into the intracellular space.
A. Hypotonic B. Colloids C. Hypertonic D. Isotonic
- Which of the following conditions can lead to cell lyses if not properly monitored?
A. Isotonicity B. Hypotonicity C. Hypertonicity D. None of the options are correct
- _____ solutions cause cell dehydration and help increase fluid in the extracellular space.
A. Hypotonic B. Osmosis C. Hypertonic D. Isotonic
- Which of the following solution has a higher osmotic concentration?
A. 200 mOsmo/kg B. 250 mOsmo/kg C. 300 mOsmo/kg D. 400mOsmo/kg
- Which of the following has more solute per kg of water?
A. 200 mOsmo/kg B. 250 mOsmo/kg C. 300 mOsmo/kg D. 400mOsmo/kg
-



In the above figure, a tube with an osmotic concentration of 300 mOsmo/kg is surrounded by an extracellular space with an osmotic concentration of 600 mOsmo/kg. Which direction will water flow?

- From extracellular space to the tube.
 - From the tube to the extracellular space.
 - There will be no movement of water.
- Cells or tissues that have a greater solute concentration than the environment in which they are submerged will _____ water and, hence cell weight will _____.
A. gain; increase B. gain; decrease C. lose; increase D. lose; decrease
 - Such cells would be considered (hyper/hypo/iso) _____ tonic compared to their environment, and the environment would be considered (hyper/hypo/iso) _____ tonic compared to the inside of the cells
A. hyper; hyper B. hyper; hypo C. hypo; hypo D. hypo; hyper

Osmosis Pre-Test Results

Class	Average Overall Score	1	2	3	4	5	6	7	8
BIO156	4.1/8	22/36	11/36	18/36	25/36	22/36	8/36	13/36	28/36
BIO202 (WC)	3.9/8	12/38	12/38	14/38	26/38	26/38	19/38	21/36	20/38
BIO202 (NR)	3.9/8	9/34	10/38	10/38	19/38	20/38	22/38	20/38	19/38