

PGas Levels in Incubators Their Effects on Premature Babies

April 23, 2007

ELE 482

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A "Little" History

In 2006, 1 in every 8 babies born was prematurely.

- When a baby is born prematurely:
- He/She is sent to the neonatal intensive care unit (NICU) to be placed inside an incubator and be taken special care of
- There is a very large risk of these babies catching diseases and every environmental factor could cause some type of lifelong damage
- In 1950, Stevie Wonder was born a premature baby, and when placed in an incubator he received excessively high oxygen levels which caused retinopathy of prematurity (which is caused by dysfunctional growth of the retinal blood vessels) and cause his blindness for the rest of his life

This Summer...

- I will be partaking in an clinical study this summer which will test the entirety of the incubators in the nursery for their gas levels
- The worry is that the equipment is out of date.
- The company that issued the incubators, which he did not mention, will not give up the data sheets with the "supposed" gas levels of the incubators
- Since they have updated the codes and regulations for gas levels in the past few years, the hospital needs to update their equipment
- We will be designing our own test equipment to measure the levels of CO₂ and O₂, as well as other gases to make sure that the baby is not being harmed by the gases being recycled



The Electronics Involved in Incubation

Measurements of 'blood gases' -- the amounts of oxygen and carbon dioxide in the blood -- are important for babies with a breathing difficulty and can be done in several ways:

- Blood gas analyzer- measures oxygen and carbon dioxide in samples taken from an arterial line -- a fine tube usually inserted in an artery in the belly button, wrist or ankle.
- Pulse oximeter (oxygen saturation monitor)- contains a light activated sensor which responds to infra-red light that is shone through the skin -- if the blood is oxygen rich, the skin is red, if the blood is oxygen deprived, its blue, in which case an alarm will sound (if a baby is oxygen deprived, the blood goes to vital organs before

the skin so a shortage in oxygen is apparent in the skin first)

- Transcutaneous monitor- a heat-activated sensor that will measure oxygen and carbon dioxide levels in the blood flowing through a small patch of warmed skin.

Problems with CO₂ Levels

If the oxygen and carbon dioxide levels are not regulated correctly, problems are probable.

Another study entitled Effect of carbon dioxide on background cerebral electrical activity and fractional oxygen extraction in very low birth weight infants just after birth, from September 2005, showed that :

- If the areterial carbon dioxide tension allows a slower flow of blood to the cerebrum, there will be decreased cerebral electrical activity
- Cerebral Fraction Oxygen Extraction (CFOE) is increased to try to preserve the oxygen delivery to the cerebrum
- study aimed at babies that were born less than 30 weeks old (approximately a month and a half early)
- This study showed that the decrease of carbon dioxide results in a slower blood flow, so studies must be done in order to regulate the oxygen and carbon dioxide levels in incubator
- They are working on studies to further the research in this area, as it is a newer development

In the Future...

Once we complete this study, and understand whether or not the levels of recycled gases are harmful enough, we will be able to:

- Send the data to the company so they can get their equipment up to date
- Design and build some type of device that could monitor the gas levels in an improved

References

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