

ASSESSMENT OF OXYGEN AND CARBON DIOXIDE LEVELS IN A NEGATIVE PRESSURE INDIVIDUAL ISOLATION SYSTEM, ISO-POD™. Michael Luethge, RRT; Frank Freihaut, BS RRT. John M. Hauser, CHSP, The Nebraska Medical Center, Omaha, NE.

Background: Our facility has opened a Bio-Containment unit to support Homeland Security and to prepare for highly infectious diseases, e.g. SARS. We evaluated a new product designed to isolate an infectious individual for transport within the hospital or from the field to the hospital. This new product, the Iso-Pod™ system, is a portable negative pressure HEPA filtered plastic enclosure. We sought to determine if there could be excessive Oxygen (O₂) or Carbon Dioxide (CO₂) accumulation inside this device under clinical use.

Methods: The Iso-Pod™ was set up and tested in three conditions. O₂ and CO₂ levels were measured in the Iso-Pod™ using a Criticare Poet IQ gas analyzer. First, with an individual breathing room air spontaneously, O₂ and CO₂ levels were assessed at the nares. In the second and third tests, O₂ and CO₂ concentrations were measured in four quadrants and at three levels within the Iso-Pod™. In these two tests with the enclosure unoccupied, 15 lpm of O₂ and then 2.5 lpm of CO₂ was added at the head level. The intent of the study design was to evaluate whether there is sufficient flow through the Iso-Pod™ air filtration system to clear CO₂ and prevent excess accumulation of O₂. The flow of O₂ added was considered typical for O₂ administration with mask. The CO₂ added to the enclosure was at a rate 10 times normal adult CO₂ minute production.

Results: For the spontaneous breathing individual test, Inspiratory and Expiratory O₂ and CO₂ levels remained unchanged. In the O₂ test the average measured O₂ was 29% (range 25% to 60%). In the CO₂ test the average measured CO₂ was 2.1% (range 0.8% to 3.5%).

Conclusion: The clearance of CO₂ by the Iso-Pod™ air filtration system during the spontaneous breathing test was adequate. In the areas tested, when adding O₂ or CO₂, the concentration of these gases within the Iso-pod was not excessive. As expected, the highest levels of O₂ and CO₂ were found at the test gas introduction site. CO₂ levels were higher in the bottom and middle areas of the Iso-Pod.

Iso-Pod™ Spontaneous Breathing Test

Time Minutes	INSPIRATION		EXPIRATION	
	CO ₂ mmHg	O ₂ %	CO ₂ mmHg	O ₂ %
Baseline	0	21	43	16
5	0	21	44	16
15	2	21	44	16
25	2	21	45	16
30	0	21	42	16

Iso-Pod™ CO₂ environment test (2.5 lpm CO₂) and O₂ administration test (15 lpm O₂)

Quadrant	Bottom		Middle		Top	
	CO ₂ %	O ₂ %	CO ₂ %	O ₂ %	CO ₂ %	O ₂ %
Head	2.1	27	3.5	60	0.8	25
Torso	2.6	26	2.3	27	1.0	29
Thigh	2.6	27	2.3	26	2.4	26
Foot	2.5	26	2.3	26	1.0	25