Editöre mektup/Letter to the editor

Determination of optimal drying period in wet to dry weight ratio measurement

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Gravimetric methods are simple and reliable for evaluating the lung edema in ischemia reperfusion (IR) injury models (1). Wet to dry weight ratio (WDR) is the most frequently used gravimetric method in the literature. To determine WDR, the whole lung, lobes, or segments of peripheral lung are weighed after initial removal and dried in an oven at a constant temperature for a period (1). This drying period is not clear and ranges from 24 hours to two weeks in the literature (1-3). Our purpose was to determine the optimal drying period for this method in IR induced rat lung edema model.

Six rats were control and other six underwent hind limb IR injury (one hour ischemia and two hour reperfusion was applied to the right hind limb by tourniquet method) for constitution lung edema. After the lung removal, the right lungs were weighed wet, and then dried in an oven at 65°C, and weighed at 2, 4, 6, 12, 24^{th} hours to 7^{th} days. WDR was calculated using following formula; WDR = (wet-dry weight) x 100/dry weight. Mann-Whitney U test was used for analysing the difference between two groups.

Rat weights were not different in between control and IR groups (295 ± 4 vs. 297 ± 4 g, p= 0.545, respectively). In both groups, lungs lost 80% of their wet weight up to six hours and after that point, no weight loss was seen up to seven days (Table 1). Lung weights were significantly heavier in IR group than control at the all drying periods ($p< 0.05$).

The simplest way to evaluate edema formation in the lung is to use a gravimetric method. There are four measures commonly applied: lung wet weight, WDR, lung body weight index, and extravascular lung water. Yoshikawa reported that, WDR had an excellent correlation with bronchoalveolar lavage fluid albumin and total protein during graded injury, high-airway pressure lung injury in mice (4).

Currently, we showed that, the lungs in both groups lost 80 percent of their total weight in the first six hours, and this weight loss ceased after that point up to the 7^{th} day. Therefore, in contrast to classical application, six hours drying period is good enough to measure wet to dry weight ratio, and no need for the longer.

Edematous lung weights were heavier than those of controls in all drying periods. The source of this difference resulted from the water and solute substance associated with water, such as protein, and its derivatives, accumulating in the lung tissue. During drying period, the water evaporates, but solute substances remain in the alveolar space. Here, the point that sho-

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Table 1. Mann-Whitney U test was used for statistical comparison of control and IR groups.

	Lung weight (mg)#			Lung weight loss%			Wet to dry ratio		
	Control	IR	p	Control	IR	p	Control	IR	p
Wet	776 ± 78	941 ± 90	0.009*	---	---	---	---	---	---
2nd h	296 ± 62	508 ± 35	0.002*	0.61	0.57	0.310	1.72	1.02	0.004*
4th h	157 ± 21	227 ± 49	0.041*	0.79	0.78	0.818	3.97	3.87	0.598
6th h	146 ± 20	183 ± 18	0.009*	0.80	0.80	0.394	4.32	4.13	0.394
12th h	146 ± 20	183 ± 18	0.009*	0.80	0.80	0.394	4.32	4.13	0.394
24th h	146 ± 20	183 ± 18	0.009*	0.80	0.80	0.394	4.32	4.13	0.394
2nd d	146 ± 20	183 ± 18	0.009*	0.80	0.80	0.394	4.32	4.13	0.394
3rd d	146 ± 20	183 ± 18	0.015*	0.80	0.80	0.394	4.32	4.13	0.394
4th d	146 ± 20	183 ± 18	0.015*	0.80	0.80	0.394	4.32	4.13	0.394
5th d	146 ± 20	183 ± 18	0.015*	0.80	0.80	0.394	4.32	4.13	0.394
7th d	146 ± 20	183 ± 18	0.015*	0.80	0.80	0.394	4.32	4.13	0.394

* Statistically significant.
# Mean ± Standard deviation.

uld be emphasized is, whereas up to 6th hour, water is the major determinant of lung weight, as the drying period lenghtened, after 6th hour, alveolar solute materials replaced with water as the major determinant of the lung weight. Therefore, measurements after six hours drying period shows the accumulation of solute substance in tissues.

In this study, we used a hind limb IR model to induce lung edema. This model is more practical than lung IR model. We used right lungs, because total lung block contains tissues other than lung, such as, trachea and mediastinal fat tissue, and the right lung constitutes 2/3 of total lung weight. We perfused the lungs with 20-25 cmH_2O pressure, and perfusion was continued 2-3 minutes.

In conclusion, six hours drying period is good enogh to calculate WDR. No need for longer drying.

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