

# Adjustment of DLCO measurements

## 1 Introduction

Adjustments of DLCO measurements are described in detail the 2005 ERS/ATS statement.

In the paper, however, the adjustment is described as a change of the DLCO predicted values. After several discussions with opinion leaders, we have to conclude that it is more common to compute a DLadj value that is computed from the measured DLCO value. This DLadj value is then compared to the (unchanged) predicted values. The following table describes this:

Comment	Parameter	Predicted	% Predicted
	DLCO <sub>meas</sub>	DLCO <sub>pred</sub>	DLCO <sub>pred</sub> / DLCO <sub>meas</sub>
ERS/ATS statement	DLCO <sub>meas</sub>	DLCO <sub>pred</sub> * $\alpha$	DLCO <sub>pred</sub> * $\alpha$ / DLCO <sub>meas</sub>
EasyOne Pro	DL <sub>adj</sub> = DLCO <sub>meas</sub> * $\beta$	DLCO <sub>pred</sub>	DLCO <sub>pred</sub> / (DLCO <sub>meas</sub> * $\beta$ )

As can be seen from the table above, the %Predicted is the same if  $\beta = 1 / \alpha$ .

This means that the equations of the ERS/ATS statement have to be inverted (i.e. the factor is multiplied instead of divided). If compared to the original formulas in the ERS/ATS statement, the following formulas are therefore 'inverted' (multiplication instead of division and vice versa).

## 2 Adjustment for hemoglobin

The following formula is applied to correct for hemoglobin:

Male adults (age $\geq 15$ ):	DLadj = DLCO / (1.7 * Hb / (10.22 + Hb)) Hb in g/dL
Female and children (age < 15):	DLadj = DLCO / (1.7 * Hb / (9.38 + Hb)) Hb in g/dL
Unit conversion:	Hb [g/dL] = Hb [mmol/L] / 0.616 (according to other sources the factor is 0.6206)
Allowed range for Hb:	0 to 100 g/dL.
Default value for male adults (age $\geq 15$ ):	14.6 g/dL (9.00 mmol/L)
Default value for female and children (age < 15):	13.4 g/dL (8.26 mmol/L)

## 3 Adjustment for P<sub>A,O<sub>2</sub></sub> or altitude

The following formula for DLadj is applied if the patient uses supplemental O<sub>2</sub>:

$$\text{DLadj} = \text{DLCO} * (1 + 0.0035 * (\text{PAO}_2 - 100)) \quad \text{PAO}_2 \text{ in mmHg}$$

If no supplemental O<sub>2</sub> is applied the following formula is always applied to correct for altitude. The partial pressure of O<sub>2</sub> in the lungs is computed by subtracting the water vapor pressure in the lungs (47 mmHg) from the ambient pressure and multiplying it with the O<sub>2</sub> concentration:

DLadj = DLCO * (1 + 0.0031 * (PIO <sub>2</sub> - 150))	PIO <sub>2</sub> in mmHg
PIO <sub>2</sub> = (Pamb - 47) * 0.20942	Pamb and PH <sub>2</sub> O in mmHg
Unit conversion:	P [mmHg] = P [mbar] * 0.750
Pressure at altitude:	$P_{amp} = 760 \cdot \left(1 - \frac{0.0065 \cdot h}{288}\right)^{5.255}$ in mmHg, h in meters
Allowed range for P:	100 to 750 mmHg
Feet to meter conversion:	h [m] = h [ft] / 3.28084

## 4 Adjustment for COHb concentration and CO back pressure

Adjustment for Carboxyhemoglobin is performed as follows:

$DL_{adj} = DLCO / (102\% - COHb\%)$

COHb in %

Allowed range for COHb:

0 to 100%

Default value:

2% at this value  $DL_{adj}$  equals DLCO

## 5 Example of DLCO adjustment

The following shows how combined adjustments are performed:

<b>Factor</b>		<b>Adjustment for men</b>	<b>Adjustment for women and children &lt; 15 years</b>
Hemoglobin	32.4675 mmol/L	0.7023	0.69292
$P_{A,O_2}$	400 mb	1.7	1.7
COHb	30%	1.38889	1.38889
<b>Total correction factor</b>		1.6582	1.6361