

# Breathalyzer :Temperature measurement or not ?

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Few years ago, one has introduced this idea : breath temperature measurement is necessary for correcting the alcohol content result in applying Dubowski formula. For applying such a correction one has to do the hypothesis that either the result of a breathalyzer is a function of outside air temperature or breath temperature is a measurement of body temperature .

About the first hypothesis , we have demonstrated in 1995 that « the temperatures to which a driver is exposed have a very limited influence on the measurement result » . One can find experiment description in OIML Bulletin Vol XXXVI Num 1 January 1995.

In a physiological point of view , in the lungs , ethanol equilibrates between blood and alveolar air at about 37°C and for outside air temperatures between 30°C and -20°C the lung air reaches 37°C after the fifth generation in steady state . See « Finite difference analysis of respiratory heat transfer J.Appl.Physiol.61 ;6 ;1986. ». So, the outside air temperature cannot have any influence on the equilibrium blood-air.

The question is « Is there a constant relation between breath and blood temperature ? Is this relation independent of inspired air (Volume and temperature) ?

We have demonstrated and experimented that breath temperature is dependent of :

- outside air temperature.
- Volume of inspired air
- Physiological parameters like total lung capacity, vital capacity and inspiratory capacity.

But in the contrary , we need to know if the alcohol content in alveolar air remains constant whatever you do for breathing .

If you look at « Alveolar sampling and fast kinetics of tetrachloroethene in man . British journal of industrial medicine 1986 ;43 :814-824 » , you find the equation giving the variation of alveolar pressure versus time /

$$P(\text{Alv})=P(\text{Ven})+(P(\text{Alv})_0-P(\text{Ven}))\exp(-\lambda*Q/V(\text{eff}))*t$$

Where  $P(\text{Alv})$ =Alveolar pressure of alcohol

$P(\text{Ven})$ =Venous pressure of alcohol

$\lambda$ =partition coefficient

$Q$ =blood flow rate

$V(\text{Eff})$ =effective alveolar volume

$t$ =residence time

For a partition coefficient of 2100( blood/air for alcohol) and  $t=0.01$ seconde  $P(\text{Alv})=P(\text{Ven})$ .

So , one finds that :

- breath temperature depends on different outside and physiological parameters
- alcohol content is independent of these parameters .

We will show examples with human volunteers .