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Gas in Confined Spaces: The Facts

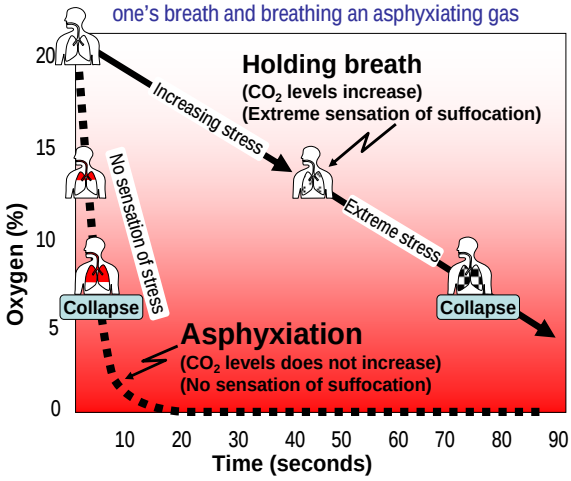
To compare holding your breath (suffocation) with breathing a gas mixture with low or no oxygen (asphyxiation) can be fatal – when you breathe a gas other than air, you no longer have the 30 to 45 seconds that you can hold your breath for self rescue or escape. Instead, you will collapse within a few seconds without recognising what is about to happen.

IMPACT OF SUFFOCATION

Suffocation happens when we hold our breath or when an airway is blocked by something we choke on, during strangling or drowning. **We are aware of what is happening**. The stress and urge to breathe becomes unbearable after 30 to 45 seconds.

The available oxygen in the lungs is **gradually** used up and the carbon dioxide in our blood and lungs increases. The brain reacts to this by causing the stress and urge to breathe to warn us of the danger. But, if a person continues to suffocate and the oxygen level reduces further, the brain can no longer function - it shuts down and the person loses consciousness.

Simplified illustration of the difference between holding one's breath and breathing an asphyxiating gas



IMPACT OF ASPHYXIATION

Except for oxygen, all gases have asphyxiating properties. Many are also toxic, flammable or have properties that could cause them to concentrate in confined spaces. If the concentration is high enough, even non-toxic gases such as argon, helium or nitrogen can kill by asphyxiation as fast as any other.

It happens WITHOUT WARNING

Victims of asphyxiation will generally not see, smell or taste the gases. When a person breathes low oxygen gas mixtures (including so-called, non-toxic gases), carbon dioxide is removed by the lungs as normal and levels in the blood remain low. The brain does not recognise the danger so gives out no warning signals. But no oxygen is delivered to the blood. When this oxygen-deprived blood reaches the brain, the brain rapidly shuts down and the person collapses without any warning. Since breathing the gases continues after collapse, the situation just gets worse.

It happens FAST

Normal breathing rate is about one breath every two seconds; one third of the lung volume is replaced by air with each breath we take. When breathing an asphyxiating gas, the oxygen in the lungs is immediately replaced and will be reduced to about 14% by one breath (2 seconds) and to about 7% by two breaths (4 seconds) – this is NOT a gradual process. One will, therefore, lose the ability of self-rescue and collapse in less than 10 seconds. After 40 seconds, the victim will be in a coma when only specialised medical attention might revive them.

A root cause of most incidents of asphyxiation is a failure to grasp how asphyxiation occurs, so underestimating the danger.

This leads to inadequate risk identification, assessment and rating, inadequate safe operating and emergency response procedures.

This can lead to inappropriate safety behaviour by those willing to take shortcuts and risks.