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| **About the Measure** | |
| **Protocol Id** | 720301 |
| **Domain:** | Tobacco Regulatory Research - Host: Biobehavioral |
| **Measure:** | Expired Carbon Monoxide |
| **Definition:** | Expired carbon monoxide biospecimens can be used to confirm current smoking status. The half-life of expired CO is 4 to 6 hours, so it is typically used to evaluate past 24-hour tobacco use. |
| **Purpose:** | Tobacco smoke is a source of carbon monoxide. Measuring expired carbon monoxide allows researchers to confirm an individual’s smoking status. |
| **Essential PhenX Protocols:** |  |
| **Related PhenX Protocols:** | Tobacco - Smoking Status - Adolescent [30601] Tobacco - Smoking Status - Adult [30602] Cigarette Smoking Status - Adolescent [30603] Cigarette Smoking Status - Adult [30604] |
| **Measure Release Date:** | February 20, 2015 |

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| **About the Protocol** | |
| **Protocol Release Date:** | February 20, 2015 |
| **Protocol Review Date:** | February 20, 2015 |
| **PhenX Protocol Name:** | Expired Carbon Monoxide |
| **Protocol Name From Source:** | Sandberg, A, et al, Assessing recent smoking status by measuring exhaled carbon monoxide levels. PLOS ONE, 2011 |
| **Protocol Availability:** | Available |
| **Keywords:** | Expired Carbon Monoxide; Smoking biomarkers; biomarkers; carbon monoxide; smoking; smoking status |
| **Description:** | This protocol describes standard operating procedures for collecting carbon monoxide samples. |
| **Specific Instructions:** | This protocol uses the Bedfont® Micro+™ Smokerlyzer; however, other similar devices may be used. |
| **Protocol:** | **Carbon Monoxide Collection: Standard Operating Procedure (SOP)**  1. Make sure the participant is standing before beginning CO collection.  a. If the participant is unable to stand, have him or her sit up as straight as possible.  2. Turn on the Bedfont Micro+ Smokerlyzer by pressing and holding the on/off button, located on the top of the monitor.  3. While the monitor is loading, attach the D-piece to the monitor and attach a cardboard mouthpiece to the D-piece. Check that all of the connections are pushed firmly together.  a. The monitor will inform you when the D-piece should be changed (approximately every 4 weeks).  b. A new cardboard mouthpiece should be used each time.  4. The monitor is ready when the display is shown.  5. Explain the instructions to the participant.  a. **Read:** *"When I tell you, I want you to take a deep breath, filling your lungs completely, and hold it for 15 seconds (***demonstrate proper deep breath***). The monitor will count down the time on the screen. Near the end of the 15 seconds when the monitor begins to beep, I will hand it to you. Please be sure that your hand is not pressing against the exhaust port on the back (***show port***). After the three beeps, I will tell you when to breathe out slowly and steadily into the monitor for at least 6 seconds. The idea is to empty your lungs. For the exhale, you want to form a tight seal with your lips around the cardboard mouthpiece (***point to mouthpiece***). When you are finished exhaling, please hand the monitor back to me. Any questions? Are you ready to begin?"*  6. Once the participant is ready to begin, touch the on-screen icon of a person blowing into a monitor to start the breath test and ask the participant to take a deep breath and hold.  7. At the end of the countdown, hand the monitor to the participant and inform the participant when to exhale.  8. Make sure the participant follows the directions properly.  9. The monitor has shown the final reading when the number stops increasing and the icons are displayed on the screen.  10. Record the expired breath carbon monoxide reading.  11. Turn off the monitor by pressing and holding the on/off button.  12. Remove the D-piece from the monitor, remove and dispose of the cardboard mouthpiece, and put the monitor and D-piece back in the case. |
| **Selection Rationale:** | The measurement of exhaled carbon monoxide provides a noninvasive, simple way of determining smoking status. |
| **Source:** | Sandberg, A., Sköld, C. M., Grunewald, J., Eklund, A., Wheelock, Å. M. (2011). Assessing recent smoking status by measuring exhaled carbon monoxide levels. *PLoS ONE, 6*(12), e28864. doi:10.1371/journal.pone.0028864 |
| **Language** | English |
| **Participant:** | Expired CO assessment has been validated in both adolescent and adult research participants. |
| **Personnel and Training Required:** | Individual trained to use Bedfont® Micro+™ Smokerlyzer |
| **Equipment Needs:** | Bedfont Micro+ Smokerlyzer, cardboard mouthpiece  This protocol uses the Bedfont® Micro+™ Smokerlyzer; however, other similar devices may be used. |
| **Standards** |  |
| **General References:** | Cummings, S., & Richard, R. (1988). Optimum cutoff points for biochemical validation of smoking status. *American Journal of Public Health, 78*, 574-575.  Jarvis, M., Tunstall-Pedoe, H., Feyebabend, C., et al. (1987). Comparison of tests used to distinguish smokers from nonsmokers. *American Journal of Public Health, 7*7, 1435-1438. |
| **Mode of Administration:** | Bioassay |
| **Derived Variables:** | None |
| **Requirements:** | |  |  | | --- | --- | | **Requirement Category** | **Required (Yes/No)** | | **Major equipment** | Yes | | **Specialized training** | No | | **Specialized requirements for biospecimen collection** | Yes | | **Average time of greater than 15 minutes in an unaffected individual** | No | |
| **Annotations for Specific Conditions:** | None |
| **Process and Review:** | Not applicable. |