

# Capsaicin Utilization for Cough-Response Elicitation (CURE): Variability in Healthy Persons – A Pilot Study

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## Introduction

Cough reflex testing is essential for detecting airway protection deficits in dysphagia. Application under **tidal breathing conditions** is not yet standardized with respect to:

- materials and methods of application
- dose-response specification
- individual impact factors

## Objective

To develop a tidal-breathing capsaicin challenge and establish a dose-response normative data base for clinical application.

## Research Questions

### 1. Dose-Response Specification:

Is there an association between increasing capsaicin doses and

1. Latency from first tidal breath to first cough?
2. Number of cough responses?
3. Urge-to-cough?

### 2. Impact Factors:

Do individual factors have an impact on cough sensitivity

- a. Gender
- b. Smoking habits
- c. Spicy-food consumption
- d. Spicy food tolerance

## Methods & Materials

### Participants:

20 healthy adults (24-45 yrs,  $M= 27.7$ ,  $SD= 4.43$ ), no neurological, respiratory or GI disease

- a. Gender: male = 16, female = 4
- b. Smoking: no = 12, yes = 8
- c. Spicy food consumption: daily = 9, weekly = 7, monthly = 4
- d. Spicy food tolerance (1-10): 3-8 ( $M= 6.2$ ,  $SD= 1.4$ )

### Capsaicin Challenge:

- 0.64 mg/drop extract (500k SHU)
- Incremental doses of 1–4 drops mixed into 200 mL carbonated water (~10.5–41.9  $\mu$ M).



solution mixed  
< 10s



tidal mouth  
breathing  
30s



washout after  
each dose  
1 min

### Data Collection:

1. Latency (s) to first cough (video-timed, 60 fps)
2. Cough count (first 15s post-inhalation)
3. Urge-to-cough (0–100 Visual Analogue Scale - VAS)

## Results

### 1. Dose-Response Specification:

1. Latency to first cough: **No significant dose effect**

Cox proportional hazards  $\rightarrow HR = 0.93$ ; 95% CI 0.69–1.26;  $p = 0.63$

2. Cough count: **No significant dose effect**

Negative-binomial GLMM  $\rightarrow IRR = 0.87$  per dose step;  $p = 0.27$

3. Urge-to-cough: **No significant dose effect**

Linear mixed model  $\rightarrow \beta = -2.55$ ;  $p = 0.40$

### 2. Impact Factors:

- a. Gender  $\Rightarrow$  **no group differences** in

1. Latency ( $U = 493.5$ ,  $z = -.238$ ,  $p = .812$ )
2. Coughs ( $U = 492$ ,  $z = -.259$ ,  $p = .796$ )
3. Urge-to-cough ( $U = 473.5$ ,  $z = -.465$ ,  $p = .642$ )

- b. Smoking habits  $\Rightarrow$  **no group differences** in

1. Latency ( $U = 704$ ,  $z = -.672$ ,  $p = .501$ )
2. Coughs ( $U = 678.5$ ,  $z = -.851$ ,  $p = .395$ )
3. Urge-to-cough ( $U = 650.5$ ,  $z = -1.16$ ,  $p = .246$ )

- c. Spicy food consumption  $\Rightarrow$  **no group differences** in

1. Latency ( $\chi^2[2] = 1.82$ ,  $p = .394$ )
2. Coughs ( $\chi^2[2] = .789$ ,  $p = .674$ )
3. Urge-to-cough ( $\chi^2[2] = .571$ ,  $p = .752$ )

- d. Spicy food tolerance  $\Rightarrow$  **no association** with

- a. Latency ( $r_s = -.063$ ,  $p = .579$ )
- b. Coughs ( $r_s = -.085$ ,  $p = .455$ )
- c. Urge-to-cough ( $r_s = -.061$ ,  $p = .592$ )

## Interesting Observations

### Significant associations:

- More coughs  $\Leftrightarrow$  higher urge-to-cough ( $r_s = .73$ ,  $p < .001$ )
- Older participants  $\Leftrightarrow$  lower latency to first cough ( $r_s = -.18$ ,  $p = .045$ )
- Smokers  $\Leftrightarrow$  fewer coughs ( $M = 0.9$ ;  $SD = 1.2$ ; 0-3) and lower urge-to-cough ( $M = 26$ ;  $SD = 26.6$ ; 0-98) than non-smokers (coughs:  $M = 1.23$ ;  $SD = 1.3$ ; 0-4, urge-to-cough:  $M = 42$ ;  $SD = 36$ ; 0-100).

## Discussion & Future Directions

- Surprisingly, we found no clear dose-response relationship in a tidal breathing Capsaicin Challenge  $\Rightarrow$  Higher capsaicin doses did not significantly alter latency, cough frequency, or urge-to-cough.
- No significant effect of gender, smoking habits and spicy-food consumption or tolerance. Occasional smokers trended toward fewer coughs and lower urge-to-cough
- Positive association between number of cough responses and subjective urge-to-cough  $\Rightarrow$  confirms general internal validity of the tidal breathing method

### Limitations:

- larger and more homogeneous sample size needed
- modification of the test procedure: dropper dosing may lack precision compared to nebulizer methods; aerosolization by carbonated water might increase response variability