Supplementary Materials

~Figures~

“Menthol-Plus”: A Major Category of Cigarette Found Among “Concept Descriptor” Cigarettes from Mexico

James F. Pankow, Wentai Luo, Kevin J. McWhirter, Samantha M. Gillette, and Joanna E. Cohen.

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Additional Supplementary Figures

S28  Triacetin vs. Menthol
S29  Total Other Flavor Chemicals (TOFCs) vs. Menthol

Supplemental material

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Figure S1.a. Pack #1. Marlboro “Fusion Shine” (M+4) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S1.b. Pack #1. Marlboro “Fusion Shine” (M+4)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S2.a. Pack #2. Lucky Strike “Convertibles” blue (M+3) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);

b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S2.b. Pack #2. Lucky Strike “Convertibles” blue (M+3)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Lucky Strike "Convertibles" blue (M+3)

TOFCs 2.36 mg/cig; TFFCs 0.33 mg/cig; TNMNFFCs 2.03 mg/cig.

Not plotted:
- #90 menthol: 9.19 mg/cig
- #124 triacetin: 17.3 mg/cig

mg/cigarette

Compound number (#)
Figure S3.a. Pack #3. Lucky Strike “Flow Filter” March

Sampler Flavour Categories: blue, M+3; orange, M+1+, red, M+1; and green, M+1.

a. Photo of pack (front);
b. Opened filter (red version) showing one crushable flavor capsule (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S3.b.1. Pack #3. Lucky Strike “Flow Filter” March/blue (M+3)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Lucky Strike "Flow Filter" March/blue (M+3)

TOFCs 2.26 mg/cig; TFFCs 0.29 mg/cig; TNMNFFCs 1.97 mg/cig.

not plotted:
#90 menthol: 9.25 mg/cig
#124 triacetin: 16.7 mg/cig
Figure S3.b.2. Pack #3. Lucky Strike “Flow Filter” March/orange (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; 
TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S3.b.3. Pack #3. Lucky Strike “Flow Filter” March/red (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S3.b.4. Pack #3. Lucky Strike “Flow Filter” March/green (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S4.a. Pack #4. Marlboro “Velvet Fusion Blast” (M+2) (Mexico)

- Photo of pack (front);
- Opened filter showing two crushable flavor capsules (uncrushed);
- Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S4.b. Pack #4. Marlboro “Velvet Fusion Blast” (M+2)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Marlboro "Velvet Fusion Blast" (M+2)

TOFCs 1.87 mg/cig; TFFCs 1.48 mg/cig; TNMNFFCs 0.39 mg/cig.

not plotted:
- #90 menthol: 11.0 mg/cig
- #124 triacetin: 11.2 mg/cig
Figure S5.a. Pack #5. Marlboro “Double Fusion Velvet” (M+2) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S5.b. Pack #5. Marlboro “Double Fusion Velvet” (M+2)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Marlboro "Double Fusion Velvet" (M+2)

TOFCs 1.63 mg/cig; TFFCs 1.29 mg/cig; TNMNFFCs 0.34 mg/cig.

not plotted:
#90 menthol: 11.3 mg/cig
#124 triacetin: 10.1 mg/cig
Figure S6.a. Pack #6. Lucky Strike “Flow Filter” (October)
Sampler Flavour Categories: light green, M+2; purple, M+1; red, M+1+; and green, M+1.

a. Photo of pack (front);
b. Opened filter (red version) showing one crushable flavor capsule (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S6.b.1. Pack #6. Lucky Strike “Flow Filter” October/lt. green (M+2)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S6.b.2. Pack #6. Lucky Strike “Flow Filter” October/purple (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S6.b.3. Pack #6. Lucky Strike “Flow Filter” October/red (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S6.b.4. Pack #6. Lucky Strike “Flow Filter” October/green (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S7.a. Pack #7. Benson & Hedges “Polar Pearls” (M+2) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S7.b. Pack #7. Benson & Hedges “Polar Pearls” (M+2)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Benson & Hedges "Polar Pearls" (M+2)

<table>
<thead>
<tr>
<th>Compound</th>
<th>mg/cigarette</th>
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<tbody>
<tr>
<td>hexyl acetate</td>
<td>0.0</td>
</tr>
<tr>
<td>43</td>
<td>0.0</td>
</tr>
<tr>
<td>55 ally hexanoate</td>
<td>0.0</td>
</tr>
<tr>
<td>68 linole</td>
<td>0.0</td>
</tr>
<tr>
<td>85 p-menthone</td>
<td>0.0</td>
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<tr>
<td>104 trans-geraniol</td>
<td>0.0</td>
</tr>
<tr>
<td>154 trans-ionone</td>
<td>0.0</td>
</tr>
<tr>
<td>158 γ-decalactone</td>
<td>0.0</td>
</tr>
<tr>
<td>167 δ-undecalone</td>
<td>0.0</td>
</tr>
<tr>
<td>174 δ-dodecalactone</td>
<td>0.0</td>
</tr>
</tbody>
</table>

TOFCs 1.36 mg/cig; TFFCs 1.15 mg/cig; TNMNFFCs 0.21 mg/cig.

not plotted:
#90 menthol: 11.9 mg/cig
#124 triacetin: 11.3 mg/cig
Figure S8.a. Pack #8. Marlboro “Amber” (M+2) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S8.b. Pack #8. Marlboro “Amber” (M+2)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Marlboro "Amber" (M+2)

TOFCs 1.27 mg/cig; TFFCs 1.08 mg/cig; TNMNFFCs 0.19 mg/cig.

not plotted:
#90 menthol: 7.88 mg/cig
#124 triacetin: 10.8 mg/cig
Figure S9.a. Pack #9. Marlboro “Double Fusion Amber” (M+2) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S9.b. Pack #9. Marlboro “Double Fusion Amber” (M+2)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds;
TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S10.a. Pack #10. Pall Mall/XL “Mystery” (M+2) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
b. Filter end of cigarette.
Photos Copyright Portland State University, 2020.
Figure S10.b. Pack #10. Pall Mall/XL “Mystery” (M+2)
TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S11.a. Pack #11. Marlboro “Capsula Fresca” (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S11.b. Pack #11. Marlboro “Capsula Fresca” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; 
TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S12.a. Pack #12. Lucky Strike “Convertibles” purple (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S12.b. Pack #12. Lucky Strike “Convertibles” purple (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S13.a. Pack #13. Pall Mall/XL “Tokyo Midnight” (M+1) (Mexico)

a. Photo of pack (front);

b. Opened filter showing two crushable flavor capsules (uncrushed);

b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S13.b. Pack #13. Pall Mall/XL “Tokyo Midnight” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Pall Mall/XL "Tokyo Midnight" (M+1)

TOFCs 0.68 mg/cig; TFFCs 0.39 mg/cig; TNMNFFCs 0.29 mg/cig.

not plotted:
#90 menthol: 8.66 mg/cig
#124 triacetin: 12.46 mg/cig
Figure S14.a. Pack #14. Marlboro “Ruby Fusion Blast” (M+1) (Mexico)

a. Photo of pack (front);

b. Opened filter showing two crushable flavor capsules (uncrushed);

b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S14.b. Pack #14. Marlboro “Ruby Fusion Blast” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds;
TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S15.a. Pack #15. Pall Mall/XL “Black Edition Maui Crepuscule” (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S15.b. Pack #15. Pall Mall/XL “Black Edition Maui Crepuscule” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

TOFCs 0.56 mg/cig; TFFCs 0.53 mg/cig; TNMNFFCs 0.03 mg/cig.

not plotted:
#90 menthol: 5.40 mg/cig
#124 triacetin: 11.8 mg/cig
Figure S16.a. Pack #16. Marlboro “Double Fusion Ruby” (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing two crushable flavor capsules (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S16.b. Pack #16. Marlboro “Double Fusion Ruby” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S17.a. Pack #17. Chesterfield “Caps Purple” (M+1) (Mexico)

- a. Photo of pack (front);
- b. Opened filter showing one crushable flavor capsule (uncrushed);
- b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S17.b. Pack #17. Chesterfield “Caps Purple” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S18.a. Pack #18. Benson & Hedges “Crystal Violet” (M+1) (Mexico)

a. Photo of pack (front);
b. opened filter showing one crushable flavor capsule (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S18.b. Pack #18. Benson & Hedges “Crystal Violet” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S19.a. Pack #19. Pall Mall/XL “Black Edition Ibiza Sunset” (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S19.b. Pack #19. Pall Mall/XL “Black Edition Ibiza Sunset” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Pall Mall/XL "Black Edition / Ibiza Sunset" (M+1)

TOFCs 0.41 mg/cig; TFFCs 0.40 mg/cig; TNMNFFCs 0.01 mg/cig.

not plotted:
#90 menthol: 3.18 mg/cig
#124 triacetin: 10.6 mg/cig
Figure S20.a. Pack #20. Pall Mall “Wave” (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushd);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S20.b. Pack #20. Pall Mall “Wave” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S21.a. Pack #21. Pall Mall/XL “Mykonos Nightfall” (M+1) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);
b. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S21.b. Pack #21. Pall Mall/XL “Mykonos Nightfall” (M+1)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

*Including the tentatively identified non-target compound 6Z-nonenal (CAS 2277-19-2, "cucumber/melon") at ~0.5 mg/cig

not plotted:
#90 menthol: 5.89 mg/cig
#124 triacetin: 13.9 mg/cig
Figure S22.a. Pack #22. Benson & Hedges “Crystal Blue” (M) (Mexico)

a. Photo of pack (front);
b. Opened filter showing one crushable flavor capsule (uncrushed);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S22.b. Pack #22. Benson & Hedges “Crystal Blue” (M)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Benson & Hedges "Crystal Blue" (M)
TOFCs 0.12 mg/cig; TFFCs 0.01 mg/cig; TNMNFFCs 0.11 mg/cig.

not plotted:
#90 menthol: 6.77 mg/cig
#124 triacetin: 8.97 mg/cig

85 8-menthone

mg/cigarette

compound number (#)
Figure S23.a. Pack #23. Next “Green” (NF) (Canada)

a. Photo of pack (front);

b. Opened filter showing a black powder (likely activated charcoal);

c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S23.b. Pack #23. Next “Green” (NF)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.

Next "Green" (NF)
TOFCs 0.01 mg/cig; TFFCs <0.01 mg/cig; TNMNFFCs ~0 mg/cig.
not plotted:
#90 menthol: <0.01 mg/cig
#124 triacetin: 3.07 mg/cig
Figure S24.a. Pack #24. John Player “Choice” (NF) (Canada)

a. Photo of pack (front);
b. Opened filter;
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S24.b. Pack #24. John Player “Choice” (NF)
TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds;
TNMNFFCs = total non-menthol non-fruit flavour compounds.

John Player "Choice" (NF)
TOFCs 0.01 mg/cig; TFFCs 0.01 mg/cig; TNMNFFCs ~0 mg/cig.
not plotted:
#90 menthol: <0.01 mg/cig
#124 triacetin: 9.63 mg/cig
Figure S25.a. Pack #25. Benson & Hedges “Unison” (NF) (Canada)

a. Photo of pack (front);
b. Opened filter showing a black powder (likely activated charcoal);
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S25.b. Pack #25. Benson & Hedges “Unison” (NF)
TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S26.a. Pack #26. Camel “North, Aqua Filter” (NF) (Canada)

a. Photo of pack (front);
b. Opened filter showing cavity;
c. Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S26.b. Pack #26. Camel “North, Aqua Filter” (NF)

TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S27.a. Pack #27. du Maurier “Nano Blue” (NF) (Canada)

**a.** Photo of pack (front);
**b.** Opened filter showing a black powder (likely activated charcoal);
**c.** Filter end of cigarette.

Photos Copyright Portland State University, 2020.
Figure S27.b. Pack #27. du Maurier “Nano Blue” (NF)
TOFCs = total other flavour compounds; TFFCs = total fruit flavour compounds; TNMNFFCs = total non-menthol non-fruit flavour compounds.
Figure S28. Triacetin (mg/cigarette) vs. menthol (mg/cigarette).
Figure S29. TOFCs (mg/cigarette) vs. menthol (mg/cigarette).