IDENTIFICATION OF A VOLATILE ORGANIC COMPOUND PROFILE FOR BOAR TAINT DETECTION IN FAT SAMPLES BY HEADSPACE-GC×GC-TOFMS

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2 – TERRA Teaching and Research Center, Gembloux Agro-Bio Tech, University of Liège,5030 Gembloux, Belgium.
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Background and scientific issues

Animal welfare is an integral part of the challenges of breeding. The pig sector is well aware of this and is working in this direction. Among these welfare aspects, **castration of piglets** remains a strong issue for which solutions must be found. A possible alternative is the **breeding of whole males**.

Nevertheless, obstacles must be overcome in terms of **meat quality**, particularly in the risk of certain males developing an unpleasant odor – **boar taint (BT)** – when the meat is cooked, which may bother more sensitive consumers.

Our study

Boar taint (**BT**):
- **Unpleasant smell** and **taste** for some consumers
- Mainly caused by the accumulation of **skatole**, **androstenone** and **indole** in fat [1]
- 4 - 7 % of uncastrated pigs
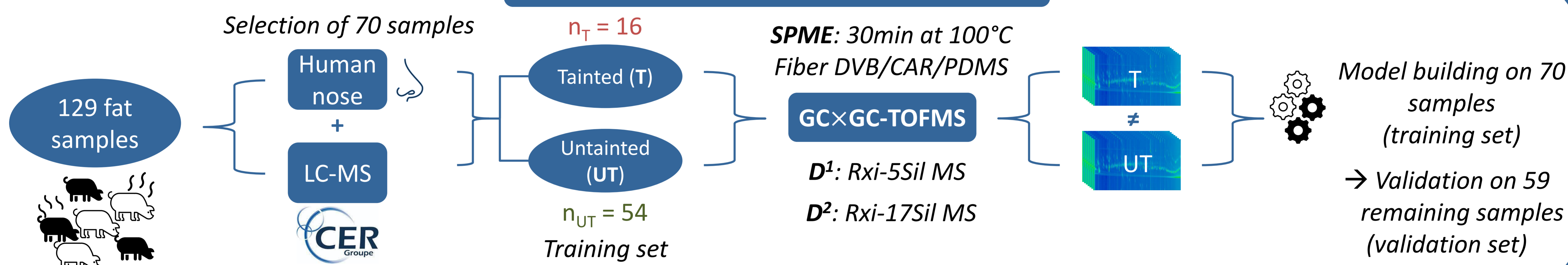- Discriminated in slautherhouses by **olfactory testing** (human nose)

In this study:
- Total of **129 fat samples**
- **Targeted** analyses by LC-MS (CER Groupe)
- **Untargeted** analyses by Headspace-**SPME-GC×GC-TOFMS**

Aim:
Fully **characterize** the **VOC profile** – volatolome – specific to **whole BT males** and build a **statistical model** for BT detection by **GC×GC-TOFMS** as *classification standard for genomics profiling*
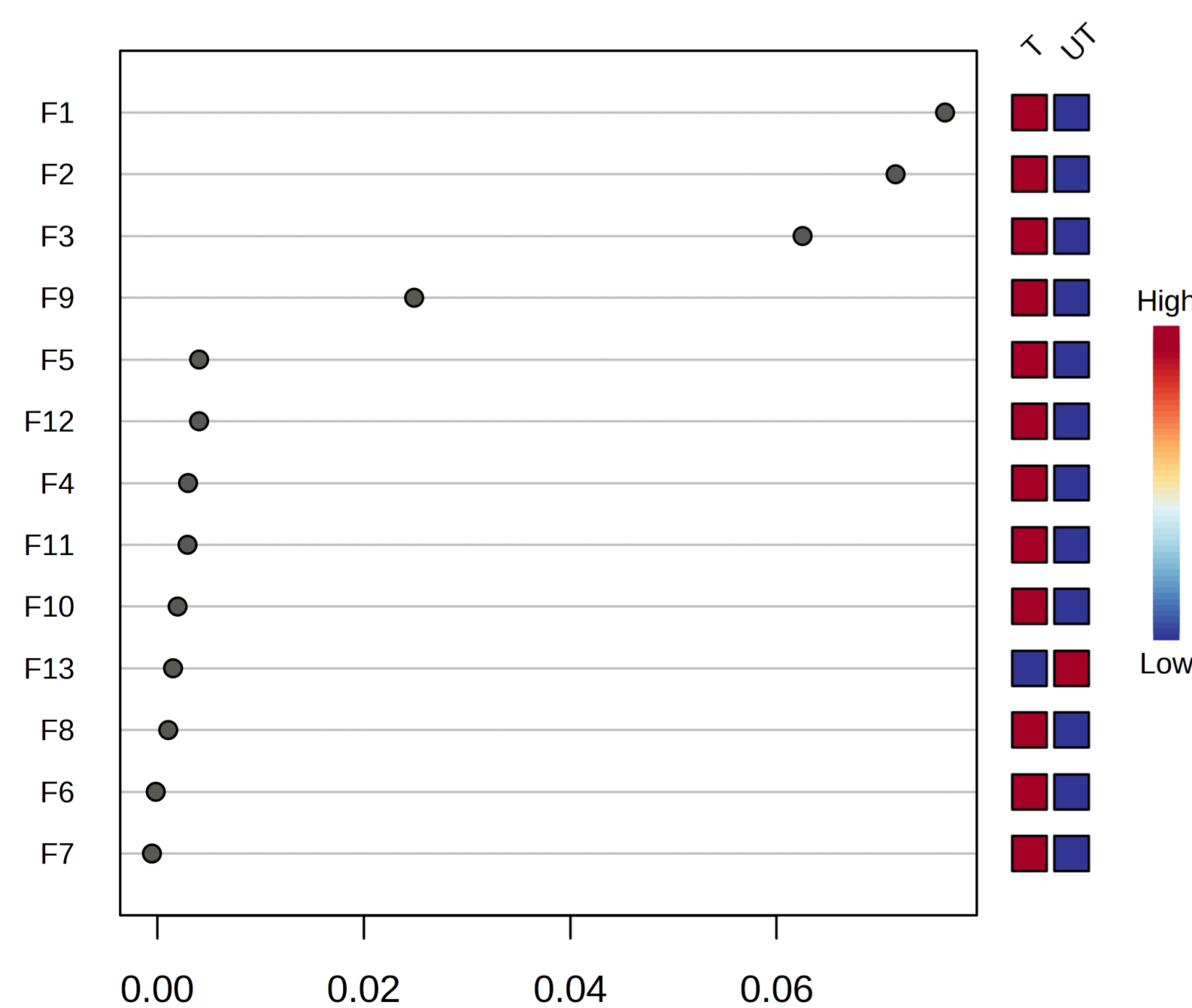
Materials and methods

Selection of 70 samples

129 fat samples → Human nose + LC-MS (CER Groupe) →

$n_T = 16$ Tainted (**T**)
$n_{UT} = 54$ Untainted (**UT**)
Training set

SPME: 30min at 100°C
Fiber DVB/CAR/PDMS
GC×GC-TOFMS
D^1: Rxi-5Sil MS
D^2: Rxi-17Sil MS

T ≠ UT

Model building on 70 samples (training set)
→ *Validation on 59 remaining samples (validation set)*

Results and discusion

Tile-based analysis on training set:

18 ≠ discriminant features (compounds) found and **selection of the top 13** (F1 to F13)

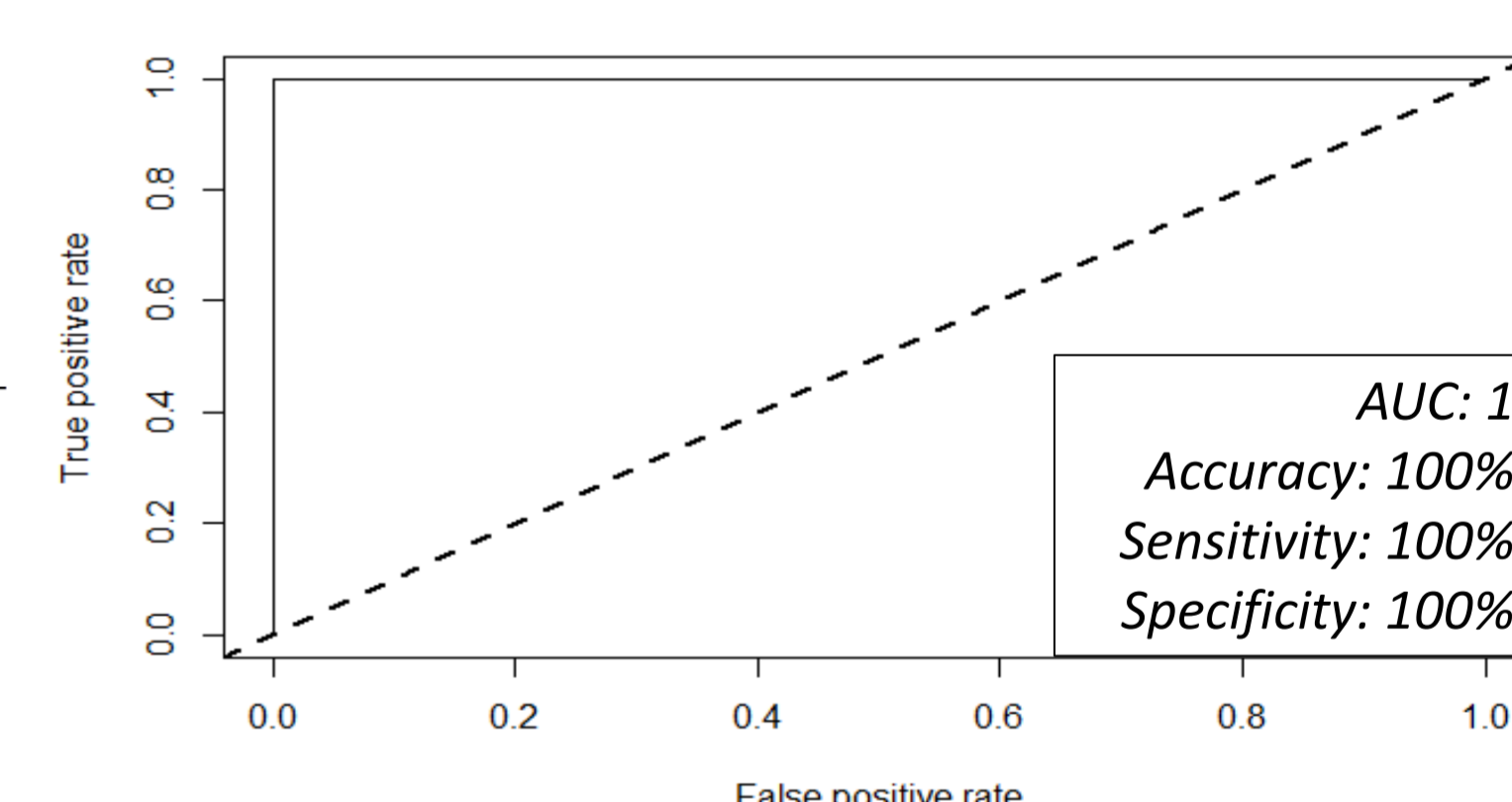**Androstenone** (F1), **skatol** (F2), and **indol** (F4) well detected with **higher contribution** for F1 and F2 in **T** samples (below)

Relationships and changes between T and UT samples. It shows clustering of F1 to F12 for T samples (in red)

Features ranked by their contributions to classification accuracy

Model evaluation (ROC curve):

AUC: 1
Accuracy: 100%
Sensitivity: 100%
Specificity: 100%

Validation set:
Based on the 70 samples model built, 59 remaining samples were classified between **UT** (in green) and **T** (in red), as displayed in the figure below

Prediction score and discrimination for BT odor on 59 remaining samples

Conclusions

- **129 fat samples** analysed
- **18 features** found and **13 selected**
- **Statistical model** built as *classification standard for genomics profiling*
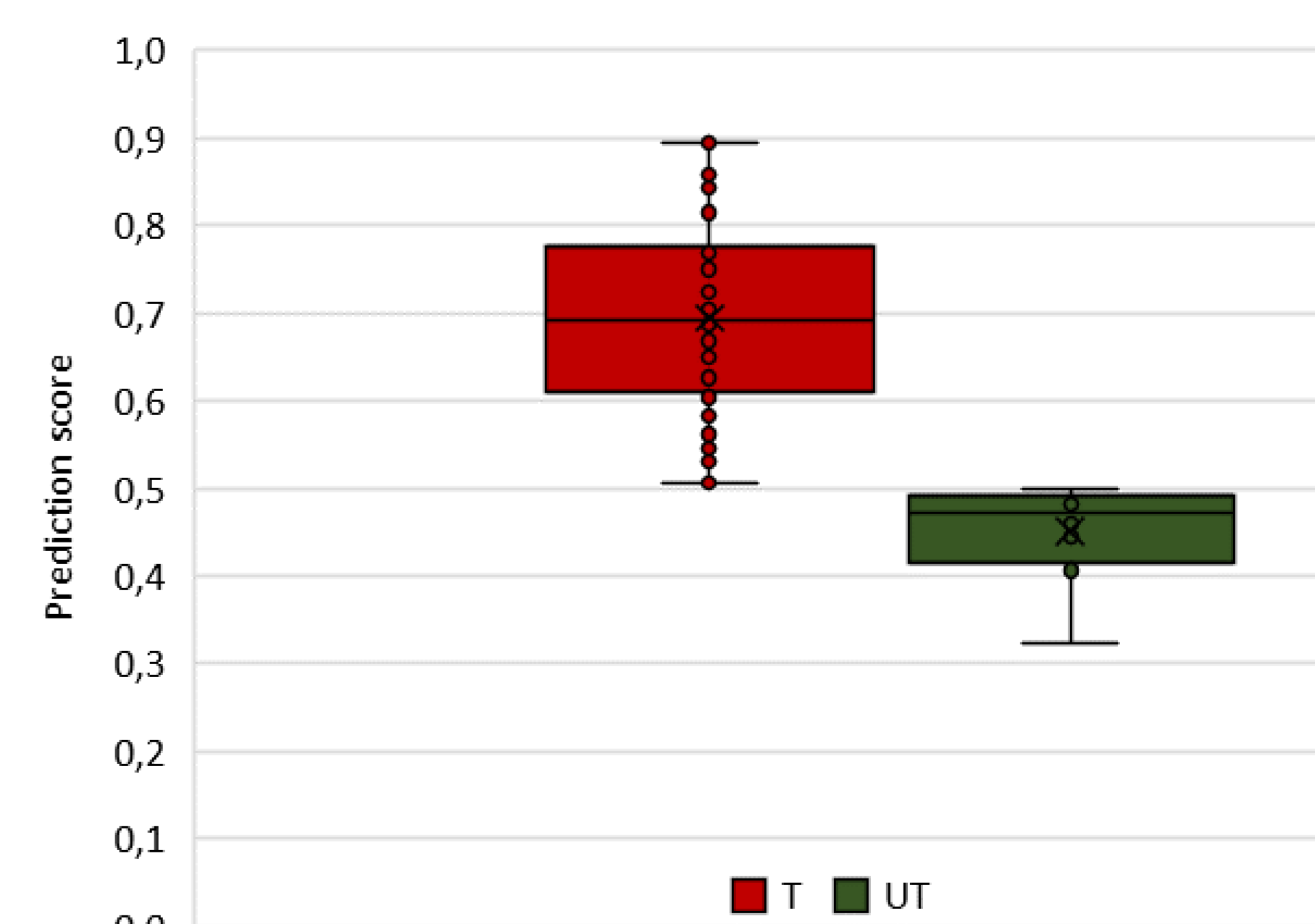- **Model validation** on an external set

→ *Possible application to **unknown** samples for **boar-tainted detection** using GC×GC-TOFMS*

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References
[1] Rius, M. A., Hortós, M., & García-Regueiro, J. A. (2005). Influence of volatile compounds on the development of off-flavours in pig back fat samples classified with boar taint by a test panel. *Meat Science*, 71(4), 595-602.

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