Data Article

Olfactory perception of 5\(\alpha\)-androst-16-en-3-one: Data obtained in the residents of central Russia

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A R T I C L E   I N F O

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A B S T R A C T

This dataset describes olfactory perception of androstenone (5\(\alpha\)-androst-16-en-3-one) in residents of central Russia \((n=807, \, 9-84\) years old). Based on previous studies, 3.13 \(\times\) 10\(^{-3}\)\% androstenone was utilized for sensory testing. A modified two-alternative choice task with “no-difference” options was applied as an odor discrimination procedure. The participants rated the perceived odor intensity and pleasantness on 3-point categorical scales. The subsequent task was free odor identification. We used a survey to determine characteristics of our study population such as age, sex, ethnicity, olfactory abilities, smoking habits, respiratory tract diseases, perfume use, blood group. To examine sex differences in characteristics of participants, as well as in their perception of androstenone, we have applied one-way ANOVA for age variable and Chi-square tests for categorical variables. The dataset will be useful for assessing the impact of the aforementioned factors on the perception of volatile steroids. A wide range of researchers studying verbal descriptors of specific odors and cross-cultural differences in olfactory perception may reuse this dataset. Primarily, this dataset may benefit meat industry, as androstenone, which is perceived as an unpleasant odor by about a quarter of the population, significantly contributes to pork flavor.

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Specifications Table

| Subject                              | Biological sciences, Neuroscience: Sensory Systems                                      |
|--------------------------------------|------------------------------------------------------------------------------------------|
| Specific subject area                | Human olfactory perception: specific anosmia to androstenone in different populations and the affecting factors. |
| Type of data                         | Tables                                                                                   |
| How the data were acquired           | Data were acquired via sensory testing of olfactory perception of $3.13 \times 10^{-3} \%$ androstenone in 807 participants. We followed odor discrimination approach. The applied procedure can be described as a modified two-alternative choice task with “no-difference” options. The ratings and verbal descriptors of the perceived odor, as well as study population characteristics were obtained via a survey. We used an original questionnaire. |
| Data format                          | Raw                                                                                      |
| Description of data collection       | Data were collected between 2009 and 2011. Selection of participants was based on their willingness to participate in the study and the acquired informed consent. Each participant was administered the sensory test only once. Data are included from all participants who followed the same experimental procedure and responded at least to Q1 of the questionnaire (discrimination task). |
| Data source location                 | • Institution: Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences |
|                                      | • City/Town/Region: Moscow city, Moscow oblast, Ivanovo oblast, Orel city                  |
|                                      | • Country: Russia                                                                         |
| Data accessibility                   | Repository name: Mendeley data                                                           |
|                                      | Data identification number: doi: 10.17632/trvkwzr3bc.2 [16]                                |
| Related research article             | V. V. Voznessenskaya, M. A. Klyuchnikova, Individual variability of human olfactory sensitivity to volatile steroids: Environmental and genetic factors, Dokl. Biol. Sci. 473 (2017) 77–79. https://doi.org/10.1134/S0012496617020144 [15] |

Value of the Data

- The data is of significant interest to a wide range of researchers working in the field of sensory science.
- The data is useful for assessing the impact of different factors such as age, sex, self-reported olfactory abilities, smoking habits, perfume use, and blood group on the perception of volatile steroids.
- A wide range of researchers interested in verbal descriptors of specific odors and cross-cultural differences in olfactory perception may benefit from this dataset.
- Food product developers may benefit from this data due to the fact that androstenone (perceived as an unpleasant odor by about a quarter of the population) is a significant component of pork, celery, and truffles.
- The dataset may have applications for development of perfumery products and deodorants since androstenone is associated with human male body odor.

1. Objective

Normal olfactory sensitivity is highly variable among humans. In case of a specific anosmia, sensitivity to a distinct odor or class of odors is significantly reduced, while general olfactory
performance remains unaffected [1]. A specific anosmia to androstenone is one of the most common, with the prevalence estimates varying from 2 to 50% [2–4]; however, there was some debate over the low rates [5,6]. Specific anosmia to androstenone is inheritable [7,6] and accounts in part for human olfactory receptor OR7D4 genotype [8–10]. Interestingly, in some specific anosmics, the sensitivity can be induced by repeated exposures [11–12]. Cross-cultural differences in androstenone perception were suggested [2]. Androstenone is a major constituent of boar taint, which negatively affects pork products consumption [13]; it is also present in celery and truffles. Androstenone spray is used on swine farms for artificial insemination procedures. Androstenone also contributes to human body odor since it is found in human urine and axillary secretions [14].

Here, we present a dataset that relates to our research on olfactory sensitivity to androstenone in the Russian population [15]. The original article was published in the form of short communication and did not include detailed methodology or supplementary materials.

2. Data Description

The dataset is provided as an Excel file (.xlsx), which includes two sheets. The first sheet - “Data” contains the original dataset that was used for analyses in [15], and here we have added previously unused data from 85 participants of the study. The variable “SUBSET” (1/0) marks the subsets of the original article [15] and the recent additions, respectively. The second sheet - “Data codes” includes the names of the variables and the assigned data codes, along with the survey questions for each variable. The dataset is publicly shared at Mendeley data repository [16].

Tables 1–3 describe the contents of the dataset at a glance.

The translated questionnaire, which was used to collect data, as well as the corresponding list of the names of the variables and the assigned data codes are shown in Table 1. All variables and data codes that directly relate to this article are explained in this table.

Table 2 provides characteristics of the study participants by sex groups and in total, viz. age, ethnicity, rate of olfactory perception of $3.13 \times 10^{-3}$% androstenone, self-reported olfactory abilities, smoking habits, respiratory diseases, perfume use, blood group, possible oral contraceptive use and pregnancy.

Table 3 describes the contents and the completeness of the dataset in relation to ratings of the perceived odor in participants, viz. odor pleasantness, odor intensity, free odor identification. In this table, the participants are categorized into two groups based on whether they perceived

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Table 1

| Question                                                                 | Dataset variable name | Answer options                              | Corresponding data codes$^a$ |
|-------------------------------------------------------------------------|-----------------------|---------------------------------------------|-----------------------------|
| Q1: You are allowed to sniff each tube for up to 30 sec. Did you perceive any odors from one or both test tubes? Indicate the tube with the strongest odor (only if the odor samples were not identical). | TEST_TUBE             | Tube #1 smells stronger$^b$                  | “1”                         |
|                                                                         |                       | Tube #2 smells stronger$^c$                  | “2”                         |
|                                                                         |                       | Both tubes are odorless                      | “0”                         |
|                                                                         |                       | Both tubes smell the same                    | “3”                         |
| DISCRIMINATE                                                            |                       |                                             |                             |

In case you have perceived the odor, describe the odor from the tube you indicated in Q1, or the odor from both tubes (if they smelled the same).

(continued on next page)
Table 1 (continued)

| Question                                                                 | Dataset variable name | Answer options                           | Corresponding data codes\(^a\) |
|--------------------------------------------------------------------------|-----------------------|------------------------------------------|--------------------------------|
| In case you have not perceived any odors, go to Q5.                     |                       |                                          |                                |
| Q2: How would you rate the quality of this odor?                         | PLEASANTNESS          | Unpleasant                               | “0”                            |
|                                                                          |                       | Neutral                                  | “1”                            |
|                                                                          |                       | Pleasant                                 | “2”                            |
|                                                                          |                       | “NA”=missing value                        |                                |
| Q3: How intense is this odor?                                            | INTENSITY             | Faint                                    | “0”                            |
|                                                                          |                       | Medium                                   | “1”                            |
|                                                                          |                       | Strong                                   | “2”                            |
|                                                                          |                       | “NA”=missing value                        |                                |
| Q4: What exactly does it smell like?                                     | ODOR_ID_RUS\(^d\);    | <Field to fill->                          |                                |
|                                                                          | ODOR_ID_ENG\(^e\)     |                                          |                                |
| Q5: What is your biological sex?                                         | SEX                   | Male                                     | “1”                            |
|                                                                          |                       | Female                                   |                                |
|                                                                          |                       | Prefer not to say                         |                                |
| Q6: How old are you?                                                     | AGE                   | <Field to fill->                          |                                |
|                                                                          |                       | Prefer not to say                         |                                |
| Q7: What is your ethnicity?                                              | ETHNICITY             | <Field to fill->                          |                                |
|                                                                          |                       | “0”=Russian, “1”=other ethnic groups\(^f\) |                                |
| Q8: How do you rate your general olfactory sensitivity?                  | OLF_ABILITIES         | Prefer not to say                         | “5”                            |
|                                                                          |                       | No sense of smell                         | “0”                            |
|                                                                          |                       | Reduced                                  | “1”                            |
|                                                                          |                       | Normal                                   | “2”                            |
|                                                                          |                       | Increased                                | “3”                            |
|                                                                          |                       | Prefer not to say                         | “5”                            |
|                                                                          |                       | Never                                    | “0”                            |
|                                                                          |                       | Occasionally                             | “1”                            |
|                                                                          |                       | Regularly                                | “2”                            |
|                                                                          |                       | Prefer not to say                         | “5”                            |
| Q9: Do you smoke?                                                        | SMOKING               | No                                       | “0”                            |
|                                                                          |                       | Yes, I have acute illness                | “1”                            |
|                                                                          |                       | Yes, I have a chronic condition          | “2”                            |
| Q10: Do you currently suffer from any respiratory diseases?              | RESP_DISEASE          | Prefer not to say                         | “5”                            |
|                                                                          |                       | Never                                    | “0”                            |
|                                                                          |                       | Occasionally                             | “1”                            |
|                                                                          |                       | Regularly                                | “2”                            |
|                                                                          |                       | Prefer not to say                         | “5”                            |
| Q11: Do you use perfume, eau de toilette, scented deodorant, etc.?       | PERFUME               | No                                       | “0”                            |
|                                                                          |                       | Yes                                      | “1”                            |
|                                                                          |                       | Prefer not to say                         | “5”                            |
| Q12: What is your blood group?                                           | BLOOD_ABO;            | <Field to fill->                          | “1”=O group, “2”=A group,      |
|                                                                          | BLOOD_RH              |                                          | “3”=B group, “4”=AB group;     |
|                                                                          |                       |                                          | “6”=Rh+, “7”=Rh-              |
|                                                                          |                       | Prefer not to say                         |                                |
| Q13-Q14 are for women 18 years and older.                                |                       |                                          |                                |
| Q13: Are you currently using oral contraceptives or preparations containing female hormones? | ORAL_CONTR            | No                                       | “0”                            |
|                                                                          |                       | Yes                                      | “1”                            |
|                                                                          |                       | Prefer not to say                         | “5”                            |
| Q14: Are you pregnant?                                                   | PREGNANCY             | No                                       | “0”                            |
|                                                                          |                       | Yes                                      | “1”                            |
|                                                                          |                       | Unsure                                   | “2”                            |
|                                                                          |                       | Prefer not to say                         | “5”                            |
| Table 1 notes:                                                           |                       |                                          |                                |
\(^a\) Data codes were assigned only if responses had been collected for the specified answer option.
\(^b\) Tube #1 contained 3mL of odorless mineral oil (control).
\(^c\) Tube #2 contained 3mL of \(3.13 \times 10^{-3}\) % androstenone.
\(^d\) Original Russian verbal description.
\(^e\) English translation of verbal description.
\(^f\) All other ethnic groups are specified in the sheet “Data codes” of the dataset.
Table 2
Characteristics of participants by sex groups.

| Questionnaire data                        | Males (n=333) | Females (n=474) | Total (n=807) | χ² & P-value |
|------------------------------------------|---------------|-----------------|---------------|-------------|
| Age, years, mean (SD)a                    | 29.60 (16.07) | 30.89 (17.21)   | 30.36 (16.75) |             |
| Range                                    | 9-80          | 11-84           | 9-84          |             |
| Ethnicity, n, % of sex groupb            |               |                 |               | 2.20 0.14   |
| Russian                                  | 197 59%       | 303 64%         | 500 62%       |             |
| Other ethnic                              | 26 8%         | 26 5%           | 52 6%         |             |
| Perception of 3.13 × 10⁻³% androstenone, n, % of sex groupc |               |                 |               | 2.95 0.09   |
| Putative detectors                        | 158 47%       | 254 54%         | 412 51%       |             |
| Putative specific                         | 175 53%       | 220 46%         | 395 49%       |             |
| anosmics                                  |               |                 |               |             |
| Self-reported olfactory abilities, n, % of sex group | 9.32 0.03 |                 |               |             |
| No sense of smell                         | 1 0%          | 0 0%            | 1 0%          |             |
| Reduced                                  | 43 13%        | 44 9%           | 87 11%        |             |
| Normal                                   | 226 68%       | 297 63%         | 523 65%       |             |
| Increased                                 | 49 15%        | 102 22%         | 151 19%       |             |
| Unknownd                                 | 14 4%         | 31 7%           | 45 6%         |             |
| Smoking habits, n, % of sex group         |               |                 |               | 21.50 <0.001|
| Never                                    | 194 58%       | 318 67%         | 512 63%       |             |
| Occasionally                              | 52 16%        | 74 16%          | 126 16%       |             |
| Regularly                                 | 80 24%        | 53 11%          | 133 16%       |             |
| Unknownb                                  | 7 2%          | 29 6%           | 36 4%         |             |
| Suffering from any respiratory tract diseases, n, % of sex group | 1.23 0.54 |                 |               |             |
| No                                       | 245 74%       | 351 74%         | 596 74%       |             |
| Acute illness                             | 36 11%        | 50 11%          | 86 11%        |             |
| Chronic condition                         | 39 12%        | 43 9%           | 82 10%        |             |
| Unknownb                                  | 13 4%         | 30 6%           | 43 5%         |             |
| Perfume use, n, % of sex group            |               |                 |               | 61.50 <0.001|
| Never                                    | 87 26%        | 39 8%           | 126 16%       |             |
| Occasionally                              | 128 38%       | 166 35%         | 294 36%       |             |
| Regularly                                 | 100 30%       | 243 51%         | 343 43%       |             |
| Unknownb                                  | 18 5%         | 26 5%           | 44 5%         |             |
| ABO blood group, n, % of sex group         |               |                 |               | 1.81 0.61   |
| 0                                        | 60 18%        | 82 17%          | 142 18%       |             |
| A                                        | 84 25%        | 113 24%         | 197 24%       |             |
| B                                        | 39 12%        | 69 15%          | 108 13%       |             |
| AB                                       | 15 5%         | 17 4%           | 32 4%         |             |
| Unknownb                                  | 135 41%       | 193 41%         | 328 41%       |             |
| Rh blood group, n, % of sex group          |               |                 |               | <0.001 0.99 |
| Rh+                                      | 95 29%        | 142 30%         | 237 29%       |             |
| Rh-                                      | 24 7%         | 36 8%           | 60 7%         |             |
| Unknownb                                  | 214 64%       | 296 62%         | 510 63%       |             |
| Oral contraceptive use, n, % of female groupd |           |                 |               |             |
| No                                       | 300 75%       |                 |               |             |
| Yes                                      | 15 4%         |                 |               |             |
| Unknownb                                  | 85 21%        |                 |               |             |
| Pregnancy, n, % of female groupd          |               |                 |               |             |
| No                                       | 288 72%       |                 |               |             |
| Yes                                      | 4 1%          |                 |               |             |
| Unknownb                                  | 108 27%       |                 |               |             |

Table 2 notes:
- All other ethnic groups are specified in the sheet “Data codes” of the dataset.
- “Unknown” refers to the data codes for “prefer not to say”, “unsure”, missing values.
- A participant was defined as “putative detector” if the option “Tube #2 smells stronger” (correct response) in the Q1 of the questionnaire was chosen. A participant was defined as “putative specific anosmic” if any of the other three options were chosen (Table 1).
- These questions were specific to women 18 years and older (n=400).
- Analyses were performed to examine sex differences. Unknowns were not included in analyses.
- ANOVA F(1,804)=1.15, p=0.28
Table 3
The ratings of the perceived odor provided by participants.

| Group | Questionnaire data | Male | Female | Total | χ²c | P-value |
|-------|--------------------|------|--------|-------|------|---------|
|       |                    | n=158| n=254  | n=412 |      |         |
| Putative androstenone detectors<sup>a</sup> | Odor pleasantness, n, % of sex group |       |        |       |      |         |
|       |                    | Unpleasant | 82  52% | 147  58% | 229  56% | 1.10 | 0.58    |
|       |                    | Neutral    | 41   26% | 58   23% | 99   24% |        |         |
|       |                    | Pleasant   | 25   16% | 37   15% | 62   15% |        |         |
|       |                    | Unknown<sup>b</sup> | 10  6% | 12   5% | 22   5% |        |         |
|       | Odor intensity, n, % of sex group |       |        |       | 19.81 <0.001 | |
|       |                    | Faint      | 85   54% | 88   35% | 173  42% |        |         |
|       |                    | Medium     | 50   32% | 90   35% | 140  34% |        |         |
|       |                    | Strong     | 19   12% | 70   28% | 89   22% |        |         |
|       |                    | Unknown<sup>b</sup> | 4   3% | 6   2% | 10   2% |        |         |
| Putative specific anosmics to androstenone<sup>b</sup> | Odor identification task, n, % of sex group | 155  98% | 251  99% | 406  99% | 3.50 | 0.17    |
|       |                    | Unknown<sup>b</sup> | 3   2% | 3   1% | 6   1% |        |         |
|       |       | n=175 | n=220  | n=395 |      |         |
|       |       | n=175 | n=220  | n=395 |      |         |
|       | Odor pleasantness, n, % of sex group |       |        |       |      |         |
|       |                    | Unpleasant | 10   6% | 22   10% | 32   8% | 0.58 | 0.75    |
|       |                    | Neutral    | 2    1% | 4    2% | 6   2% |        |         |
|       |                    | Pleasant   | 21   12% | 19   9% | 40   10% |        |         |
|       |                    | Unknown<sup>b</sup> | 142  81% | 175  80% | 317  80% |        |         |
|       | Odor intensity, n, % of sex group |       |        |       |      |         |
|       |                    | Faint      | 43   25% | 51   23% | 94   24% |        |         |
|       |                    | Medium     | 10   6% | 13   6% | 23   6% |        |         |
|       |                    | Strong     | 2    1% | 1    0% | 3   1% |        |         |
|       |                    | Unknown<sup>b</sup> | 120  69% | 155  70% | 275  69% |        |         |
|       | Odor identification task, n, % of sex group | 70   40% | 93   42% | 163  41% |        |         |
|       |                    | Unknown<sup>b</sup> | 105  60% | 127  58% | 232  59% |        |         |

Table 3 notes:
<sup>a</sup> A participant was defined as “putative detector” if the option “Tube #2 smells stronger” (correct response) in the Q1 of the questionnaire was chosen. A participant was defined as “putative specific anosmic” if any of the other three options were chosen (Table 1).
<sup>b</sup> “Unknown” here refers to missing values.
<sup>c</sup> Chi-square tests were performed to examine sex differences. Unknowns were not included in analyses.
the odor of $3.13 \times 10^{-3}\%$ androstenone as stronger than the control ("putative detectors"), or not ("putative specific anosmics").

3. Experimental Design, Materials and Methods

3.1. Participants

The study examines 807 participants, 662 of whom were adults (18-84 years) and 145 were children and adolescents (9-17 years). The participants and the official guardians in case of minors were recruited via personal communication, by email, through social networks in Moscow city, Moscow oblast, Ivanovo oblast, Orel city (all the sites are within central Russia). There was no selection of participants; all willing and consenting candidates were admitted.

The COVID-19 pandemic has generated considerable evidence over the recent years on the persistence of long-lasting olfactory distortions such as parosmia and phantosmia [17,18]. However, these data were collected before the pandemic between 2009 and 2011.

4. Materials

More than 98% pure 5α-androst-16-en-3-one (CAS Number: 18339-16-7, Sigma-Aldrich® Cat. # A8008) was dissolved in odorless white light mineral oil from the same supplier (CAS Number: 8042-47-5, Sigma-Aldrich® Cat. # M8410). The $3.13 \times 10^{-3}\%$ (w/v) testing solution was prepared by serial dilution of 0.1% (w/v) stock solution. This concentration of stimulus was chosen based on previous reports of sensory thresholds in the US population in which over 85% of androstenone detectors perceived it [4]. Another reason for this choice was to minimize the non-specific stimulation of the trigeminal nerve [5].

3mL of $3.13 \times 10^{-3}\%$ androstenone or 3mL of mineral oil (control) were placed into identical 15mL clear glass test tubes with screw caps. Tube dimensions were 115 mm height $\times$ 16 mm outer diameter $\times$ 12 mm opening diameter. The samples were marked with an odorless wax pencil as #2 and #1, respectively. These marks were hidden from the participants. The solutions were stored at $+4^\circ$C and brought to room temperature an hour before testing. Stimuli were renewed once a week.

The questionnaire (Table 1) was printed to fill in by hand.

5. Methods

To screen the participants for specific anosmia to androstenone, we followed the odor discrimination approach [19]. More specifically, the applied procedure can be described as a modified two-alternative choice task with “no-difference” options. “No-difference” category was split into two options, such as “both tubes are odorless” and “both tubes smell the same”, mainly to simplify the test logic for the subsequent rating and identification tasks (Table 1). Each participant was administered the test only once. While this can be considered a shortcoming, it made it possible to attract a large number of participants. Following not having consumed food or smoked for at least 1 h, participants were individually tested indoors. Minors had their guardians or teachers present during the test. The participants were presented with a pair of tubes, one containing androstenone (tube#2) and the other with mineral oil (tube#1, control). The tubes were given in random order by the experimenters who were unable to detect androstenone themselves. Participants were unaware of the true nature of the contents of the tubes. But they have been told that there is no wrong answer. The participants sniffed each of the tubes at their own pace for several seconds and were allowed to repeat the sniffing procedure upon request within 30 sec. Afterwards they responded to the Q1-Q4 of the questionnaire about the perceived
odor (Table 1, discrimination task, rating of intensity and pleasantness, identification). These four questions were read out loud by the test administrators who also marked the chosen options. In the discrimination task, if the participants had perceived the odor from one of the tubes, they were asked to point to it, and the experimenter marked the option in accordance with the hidden sample label. If the participants had perceived different odors from both tubes, they were asked to indicate the tube with the strongest odor. The chosen 3-point scales for intensity and pleasantness were based on semantic bipolarity (faint – strong, unpleasant – pleasant), with a “neutral” point included (Table 1, Q2-Q3). The children have already been acquainted with choice-based tests and antonyms at school and did not experience difficulties with these tasks. No hints or options were provided in the free odor identification task (Q4). Those participants, who had sensed the identical smell from both tubes in the discrimination task, were also surveyed about the perceived odor. Then the participants answered all the remaining Q5-Q14 questions about age, sex, ethnicity, olfactory abilities, smoking habits, respiratory tract diseases, perfume use, blood group, etc. (Table 1) They did so themselves or with the gentle help of their guardians and teachers in case of minors. If the participants had not perceived any odor in the discrimination task, they were instructed to skip Q2-Q4 (about odor intensity, pleasantness and word description) and to continue with Q5 of the questionnaire (demographics etc.). Q13-Q14 (about pregnancy, oral contraceptives) were specific to women 18 years and older. Participants were not forced to answer any questions that they were unwilling to answer. The questionnaire was in Russian.

6. Data Analysis

Data from all participants who provided unambiguous responses at least to Q1 of the questionnaire (discrimination task) and were not involved in any other experimental procedures prior to the test have been analyzed (n=807). All demographic characteristics are provided as they were self-reported by the participants. Other ethnic groups were combined into a single group since the numbers in many ethnicities were so small to potentially identify the study participants. All these ethnic groups are specified in the sheet “Data codes” of the dataset [16].

In order to estimate the rate of specific anosmia [1] to androstenone in the study sample, we have subdivided the participants into “putative detector” and “putative specific anosmic” groups. A participant was considered “putative detector” if the option “Tube #2 smells stronger” (correct choice) was selected in the discrimination task (Q1). A participant was identified as “putative specific anosmic” if the options “Tube #1 smells stronger”, or “Both tubes are odorless”, or “Both tubes smell the same” were chosen in response to this question. Performing only a single trial in the discrimination task can be considered a limitation of our study design, as with four choice alternatives there was a 25% random chance of selecting the correct response. Nonetheless, we assume that “no-difference” alternatives have increased the discriminating power of the test, promoting subjects with reduced sensitivity to select one of these options rather than to “guess” the tube. Still yet, our assignment of participants to “specific anosmics” and “detectors” is only tentative.

The data were described using means, standard deviations, ranges, frequencies, and percentages. To examine sex differences in characteristics of participants, as well as in their perception of androstenone (Tables 2, 3), we have applied one-way ANOVA for age variable, and Chi-square tests for categorical variables. All analyses were conducted using STATISTICA (data analysis software system), version 8.0 (StatSoft, Inc.). An alpha level of 0.05 was used as a significance criterion for all statistical tests.

Verbal descriptors of the perceived odor provided by the participants were translated from Russian into English using a validated procedure previously applied by Global Consortium for Chemosensory Research [20], and by the same translators. Briefly, the original word description was translated by two independent translators, back translation was performed by the third independent translator, and then all discrepancies between the translations were resolved. Close synonyms, synonymic sentences, single-root words and word forms were unified.
Ethics Statements

The relevant informed consent forms were obtained from all participants. All the minors gave their assent and their legal guardians provided the relevant informed consent to participate at the time of conducting the study. The research was carried out in accordance with the Declaration of Helsinki. All procedures were approved by the Institutional Ethical committee (protocol number 23/2009).

CRediT Author Statement

Maria A. Klyuchnikova: Investigation, Methodology, Data curation, Formal analysis, Writing – original draft; Ilya G. Kvasha: Investigation, Data curation, Writing – review & editing; Tatiana K. Laktionova: Investigation, Data curation, Writing – review & editing; Vera V. Voznessenskaya: Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Olfactory perception of 5α-androst-16-en-3-one among residents of central Russia (Original data) (Mendeley Data).

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