Data Article

RNA-Seq transcriptome data of the liver of common Pekin, Muscovy, mule and Hinny ducks fed ad libitum or overfed

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A B S T R A C T

Duck species are known to have different ability to fatty liver production in response to overfeeding and gene expression analyses can help to characterize mechanisms involved in these differences. This data article reports the sequencing of RNAs extracted from the liver of Pekin and Muscovy duck species and of their reciprocal hybrids, Mule and Hinny ducks fed ad libitum or overfed. Libraries were prepared by selecting polyadenylated mRNAs and RNA Sequencing (RNASeq) was performed using Illumina HiSeq2000 platform. RNASeq data presented in this article were deposited in the NCBI sequence read archive (SRA) under the accession number SRP144764 and links to these data were also indicated in the Data INRAE repository (https://doi.org/10.15454/JJZ3QQ). Transcriptome analyses of these data were published in Hérault et al. (2019) and Liu et al. (2020).

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**Specifications Table**

| Subject | Biological sciences |
|---------|---------------------|
| Specific subject area | Omics: Transcriptomics |
| Type of data | Sequence data |
| How data were acquired | High throughput RNA sequencing |
| Data format | FASTQ files (raw data) |
| Parameters for data collection | 4 duck genetic types: |
| | - Common Pekin duck (*Anas platyrhynchos*, Ap) |
| | - Muscovy duck (*Cairina moschata*, Cm) |
| | - Mule hybrid (Cm x Ap) |
| | - Hinny hybrid (Ap x Cm) |
| 2 feeding status: | - Fed *ad libitum* |
| | - Overfed with corn |
| Description of data collection | Total RNA was extracted, then polyA RNA fraction was enriched and used for construction cDNA libraries using an Illumina TruSeq RNA Sample Prep Kit v2. RNA sequencing was performed on an Illumina HiSeq2000 using a paired-end read length of 2 × 100 pb with the Illumina HiSeq2000 SBS v3 sequencing kit. |
| Data source location | INRAE, UMR PEGASE, Saint-Gilles, France |
| Data accessibility | Raw RNA-seq data were deposited to the NCBI sequence read archive (SRA) under the accession number SRP144764, [https://www.ncbi.nlm.nih.gov/sra/SRP144764](https://www.ncbi.nlm.nih.gov/sra/SRP144764). The data can also be accessed through Data INRAE, [https://doi.org/10.15454/jjz3qq](https://doi.org/10.15454/jjz3qq). |

**Value of the Data**

- These data represent hepatic transcriptomes from 4 different duck genetic types (“pure” species and hybrids) fed *ad libitum* or overfed and can be used to analyze responses to overfeeding and differences between genetic types.
- Any researchers involved in liver gene expression and metabolism can benefit from these data and process raw FASTQ files.
- These data can be included in meta-analyses to characterize responses to feeding in different duck breeds.

1. Data Description

Data provided in this article were obtained from liver samples of male Pekin ducks fed *ad libitum* (*n* = 10) or overfed (*n* = 10), Muscovy ducks fed *ad libitum* (*n* = 9) or overfed (*n* = 10), Mule duck hybrids fed *ad libitum* (*n* = 10) or overfed (*n* = 10) and Hinny duck hybrids fed *ad libitum* (*n* = 10) or overfed (*n* = 10). A liver weight increase was observed in overfed ducks when compared to ducks fed *ad libitum* ad libitum. This increase was more or less significant depending on the genetic type (Fig. 1).

RNA were extracted from the liver of these ducks and sequenced. Raw sequences FASTQ files were deposited in the NCBI sequence read archive under the study accession number SRP144764 and can also be accessed through Data INRAE with doi:10.15454/jjz3qq. Duck sample names, genetic types, feeding conditions and liver weights, SRA accession number (experiment) for direct access to FASTQ files and number of reads are indicated in Table 1.

2. Experimental Design, Materials and Methods

2.1. Animals and experimental design

As described previously [1–3] male ducks from four different genetic types, i.e. Pekin, Muscovy and their crossbreed mule (male Muscovy duck x female Pekin duck) and Hinny (male
| Sample     | Genetic type | Feeding     | Liver weight (g) | Experiment | Number of reads |
|------------|--------------|-------------|------------------|------------|-----------------|
| PekAL81    | Pekin        | Ad libitum  | 58               | SRX4048434 | 54 511 592      |
| PekAL85    | Pekin        | Ad libitum  | 60               | SRX4048435 | 63 672 484      |
| PekAL89    | Pekin        | Ad libitum  | 63               | SRX4048436 | 54 632 570      |
| PekAL93    | Pekin        | Ad libitum  | 64               | SRX4048437 | 100 722 690     |
| PekAL97    | Pekin        | Ad libitum  | 67               | SRX4048430 | 62 509 638      |
| PekAL101   | Pekin        | Ad libitum  | 44               | SRX4048431 | 29 773 930      |
| PekAL105   | Pekin        | Ad libitum  | 47               | SRX4048432 | 65 912 956      |
| PekAL109   | Pekin        | Ad libitum  | 51               | SRX4048433 | 64 942 634      |
| PekAL113   | Pekin        | Ad libitum  | 57               | SRX4048442 | 41 516 114      |
| PekAL117   | Pekin        | Ad libitum  | 57               | SRX4048443 | 40 973 316      |
| PekOv1     | Pekin        | Overfed     | 122              | SRX4048413 | 49 425 436      |
| PekOv5     | Pekin        | Overfed     | 455              | SRX4048414 | 63 881 908      |
| PekOv9     | Pekin        | Overfed     | 519              | SRX4048411 | 58 273 928      |
| PekOv13    | Pekin        | Overfed     | 189              | SRX4048412 | 73 132 064      |
| PekOv17    | Pekin        | Overfed     | 338              | SRX4048409 | 42 987 014      |
| PekOv21    | Pekin        | Overfed     | 343              | SRX4048410 | 39 875 958      |
| PekOv25    | Pekin        | Overfed     | 362              | SRX4048407 | 40 240 106      |
| PekOv29    | Pekin        | Overfed     | 366              | SRX4048408 | 60 005 478      |
| PekOv33    | Pekin        | Overfed     | 385              | SRX4048405 | 62 297 874      |
| PekOv37    | Pekin        | Overfed     | 442              | SRX4048417 | 40 498 382      |
| MusAL84    | Muscovy      | Ad libitum  | 64               | SRX4048444 | 57 399 836      |
| MusAL88    | Muscovy      | Ad libitum  | 72               | SRX4048445 | 42 570 376      |
| MusAL92    | Muscovy      | Ad libitum  | 72               | SRX4048374 | 44 882 126      |
| MusAL96    | Muscovy      | Ad libitum  | 76               | SRX4048375 | 59 719 512      |
| MusAL104   | Muscovy      | Ad libitum  | 70               | SRX4048440 | 52 982 008      |
| MusAL108   | Muscovy      | Ad libitum  | 93               | SRX4048441 | 43 990 130      |
| MusAL112   | Muscovy      | Ad libitum  | 78               | SRX4048438 | 46 767 682      |
| MusAL116   | Muscovy      | Ad libitum  | 91               | SRX4048439 | 53 249 208      |
| MusAL120   | Muscovy      | Ad libitum  | 76               | SRX4048418 | 47 410 634      |
| MusOv4     | Muscovy      | Overfed     | 472              | SRX4048401 | 59 203 318      |
| MusOv8     | Muscovy      | Overfed     | 580              | SRX4048400 | 90 014 240      |
| MusOv12    | Muscovy      | Overfed     | 617              | SRX4048403 | 58 607 268      |
| MusOv16    | Muscovy      | Overfed     | 422              | SRX4048402 | 62 651 190      |
| MusOv20    | Muscovy      | Overfed     | 499              | SRX4048397 | 61 531 550      |
| MusOv24    | Muscovy      | Overfed     | 551              | SRX4048396 | 52 439 560      |
| MusOv28    | Muscovy      | Overfed     | 513              | SRX4048399 | 40 255 992      |
| MusOv32    | Muscovy      | Overfed     | 599              | SRX4048398 | 45 563 618      |
| MusOv36    | Muscovy      | Overfed     | 540              | SRX4048393 | 53 283 106      |
| MusOv40    | Muscovy      | Overfed     | 555              | SRX4048392 | 54 695 162      |
| MulAL82    | Mule         | Ad libitum  | 58               | SRX4048447 | 45 302 210      |
| MulAL86    | Mule         | Ad libitum  | 56               | SRX4048450 | 60 094 290      |
| MulAL90    | Mule         | Ad libitum  | 61               | SRX4048421 | 71 861 666      |
| MulAL94    | Mule         | Ad libitum  | 58               | SRX4048415 | 103 361 470     |
| MulAL98    | Mule         | Ad libitum  | 56               | SRX4048452 | 71 673 082      |
| MulAL102   | Mule         | Ad libitum  | 65               | SRX4048377 | 40 143 340      |
| MulAL106   | Mule         | Ad libitum  | 80               | SRX4048404 | 41 516 888      |
| MulAL110   | Mule         | Ad libitum  | 65               | SRX4048448 | 67 585 992      |
| MulAL114   | Mule         | Ad libitum  | 63               | SRX4048406 | 72 651 700      |
| MulAL118   | Mule         | Ad libitum  | 52               | SRX4048451 | 53 994 728      |
| MulOv2     | Mule         | Overfed     | 654              | SRX4048420 | 54 458 584      |
| MulOv6     | Mule         | Overfed     | 630              | SRX4048389 | 65 457 472      |
| MulOv10    | Mule         | Overfed     | 639              | SRX4048388 | 49 860 540      |
| MulOv14    | Mule         | Overfed     | 594              | SRX4048391 | 79 299 348      |
| MulOv18    | Mule         | Overfed     | 713              | SRX4048390 | 86 272 820      |
| MulOv22    | Mule         | Overfed     | 733              | SRX4048376 | 37 388 720      |
| MulOv26    | Mule         | Overfed     | 745              | SRX4048416 | 66 317 938      |
| MulOv30    | Mule         | Overfed     | 643              | SRX4048395 | 42 214 507      |
| MulOv34    | Mule         | Overfed     | 539              | SRX4048394 | 45 869 644      |
| MulOv38    | Mule         | Overfed     | 572              | SRX4048449 | 49 504 406      |
| HinAL83    | Hinny        | Ad libitum  | 56               | SRX4048378 | 51 541 602      |
| HinAL87    | Hinny        | Ad libitum  | 66               | SRX4048422 | 47 733 202      |

(continued on next page)
Table 1 (continued)

| Sample | Genetic type | Feeding     | Liver weight (g) | Experiment | Number of reads |
|--------|--------------|-------------|------------------|------------|----------------|
| HinAL91| Hinny        | Ad libitum  | 64               | SRX4048423 | 56 643 460     |
| HinAL95| Hinny        | Ad libitum  | 66               | SRX4048424 | 68 522 628     |
| HinAL99| Hinny        | Ad libitum  | 56               | SRX4048425 | 113 403 456    |
| HinAL103| Hinny       | Ad libitum  | 70               | SRX4048426 | 49 665 684     |
| HinAL107| Hinny      | Ad libitum  | 61               | SRX4048427 | 35 245 860     |
| HinAL111| Hinny      | Ad libitum  | 54               | SRX4048428 | 52 782 990     |
| HinAL115| Hinny      | Ad libitum  | 72               | SRX4048429 | 54 805 168     |
| HinAL119| Hinny      | Ad libitum  | 66               | SRX4048419 | 25 181 580     |
| HinOv3  | Hinny       | Overfed     | 485              | SRX4048446 | 49 610 528     |
| HinOv7  | Hinny       | Overfed     | 448              | SRX4048387 | 62 190 258     |
| HinOv11 | Hinny       | Overfed     | 605              | SRX4048386 | 48 695 180     |
| HinOv15 | Hinny       | Overfed     | 524              | SRX4048385 | 66 492 198     |
| HinOv19 | Hinny       | Overfed     | 512              | SRX4048384 | 64 544 886     |
| HinOv23 | Hinny       | Overfed     | 661              | SRX4048383 | 48 006 454     |
| HinOv27 | Hinny       | Overfed     | 674              | SRX4048382 | 49 328 648     |
| HinOv31 | Hinny       | Overfed     | 632              | SRX4048381 | 52 348 696     |
| HinOv35 | Hinny       | Overfed     | 452              | SRX4048380 | 34 557 162     |
| HinOv39 | Hinny       | Overfed     | 685              | SRX4048379 | 57 900 214     |

Pekin duck × female Muscovy duck) ducks, were reared under usual conditions of light and temperature at the Experimental Station for Waterfowl Breeding (Unité Expérimentale des Palmipèdes à Foie Gras, INRA Artiguères, France). From hatching to 4 weeks of age, ducks were fed with the starting diet ad libitum (free access to the diet). From 4 to 6 weeks of age, they were fed ad libitum with the growing diet. From 6 to 12 weeks of age, they were fed with the growing diet at restricted levels appropriate for each genetic type (ranging from 200 to 250 g per duck at the beginning to 360–380 g at the end of the period). At 12 weeks of age, ducks were either fed ad libitum with the growing diet or overfed 14 days with high carbohydrate overfeeding diet.

Fig. 1. Liver weights (in grams) of Pekin (Pek), Muscovy (Mus), Mule (Mul) and Hinny (Hin) ducks fed ad libitum (AL) or overfed (Ov) 14 days.
containing corn and corn meal, respectively indicated as ‘Ad libitum’ and ‘Overfed’ in Table 1. Main characteristics of starting, growing and overfeeding diets are shown in Table 2.

Fourteen hours after the last meal, ducks were rendered unconscious and unable to feel pain by electronarcosis and were slaughtered by neck sectioning and bleeding. Immediately after bleeding, liver were weighted (Table 1), and samples were collected, rapidly frozen in liquid nitrogen and stored at −80 °C until RNA extraction.

### 2.2. RNA preparation and sequencing

Total RNA were extracted from liver samples using NucleoSpin® RNA L kit (Macherey-Nagel SARL, Hoerdt, France) including guanidinium thiocyanate, silica membrane and on-column RNase-free DNase digestion according to the manufacturer’s instructions without modification. RNA concentration was determined using a NanoDrop ND-1000 Spectrophotometer (Thermo Scientific, Illkirch, France). Quality and integrity of RNA were checked using Lab-on-a-Chip Eu-karyote Total RNA Nano chip and Bionalyzer 2100 device (Agilent Technologies France, Massy, France). RNA with absorbance ratio λ260 nm/λ280 nm and λ260 nm/λ230 nm > 1.8 and RNA integrity number (RIN) > 7.4 were selected (resulting in 9–10 RNA samples per genetic type and per diet).

Libraries preparation and sequencing experiments were performed at the Genotoul genomics facility GeT-PlaGe (http://get.genotoul.fr/en/). RNA libraries were prepared according to Illumina’s protocols without modification using the Illumina TruSeq RNA Sample Prep Kit v2 (Illumina, San Diego, CA). PolyA+ mRNA were first isolated using oligo(dT) beads. Then, mRNA were frag-

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**Table 2**

Characteristics of feeding diets.

| Characteristics | Starting (0–4 weeks) | Growing (4–12 weeks) | Overfeeding (12–14 weeks) |
|-----------------|-----------------------|----------------------|---------------------------|
| ME (kcal/kg)    | 2830                  | 2850                 | 3330                      |
| CP (%)          | 18.21                 | 15.98                | 8.28                      |
| Lipids (%)      | 3.34                  | 2.84                 | 3.38                      |
| SFA (%)         | 17.17                 | 6.10                 | 14.52                     |
| MUFA (%)        | 24.98                 | 28.36                | 27.44                     |
| PUFA (%)        | 57.85                 | 55.54                | 58.02                     |

ME: metabolisable energy; CP: crude protein; SFA, MUFA, PUFA: saturated, mono-unsaturated and poly-unsaturated fatty acids. Feed for overfeeding contained corn (25%), corn meal (35%) and water (40%).

**Table 3**

Multiplexing per lane (L) of duck liver RNA libraries and tagging before sequencing.

| Tag1 | Tag2 | Tag3 | Tag4 | Tag5 | Tag6 |
|------|------|------|------|------|------|
| ATCAG| TTAGGC| ACTTGA| GATCAG| TAGCTT| GGCTAC |
| L1   | PekOv1| HinOv11| MulAL94| MulOv18| PekAL101 |
| L2   | MulAL82| PekOv5| MusAL92| HinOv15| HinAL99 |
| L3   | HinOv3 | MulAL86| PekOv9| MusAL96| MusOv20 |
| L4   | MusAL84| HinOv7| MulAL80| PekOv13| PekAL97 |
| L5   | MulOv2 | PekAL85| MusOv12| HinOv95| HinOv19 |
| L6   | PekAL81| MusOv8| HinOv91| MulOv14| MulOv98 |
| L7   | MusOv4 | HinOv87| MulOv10| PekAL93| PekOv17 |
| L8   | HinOv83| MulOv6| PekAL89| MusOv16| HinOv23 |
| L9   | PekOv25| HinOv107| MulOv30| MusAL112| HinOv35 |
| L10  | MulAL106| MusOv28| PekAL90| HinOv31| MusAL116 |
| L11  | HinOv27| PekOv105| MusOv32| MulAL110| PekOv33 |
| L12  | MusAL108| MulOv26| HinOv111| PekOv29| MulAL114 |
| L13  | PekOv37| MulAL118| HinOv39| MusAL120| MulOv38 |
| L14  | HinAL19| MulOv40| MusOv40| PekAL117| |

Hexamer tag sequences are indicated under tag numbers.
mented and reverse transcribed into double stranded cDNA. Adapters and hexamer tags (Table 3) were ligated for subsequent identification. Ten cycles of PCR were applied to amplify libraries. Library quality was assessed using an Agilent Bioanalyser (Agilent Technologies France, Massy, France) and libraries were quantified by qPCR using the Kapa Library Quantification Kit. RNA sequencing was performed with the Illumina HiSeq2000 SBS v3 sequencing kit on HiSeq2000 Illumina platform using a paired-end read length of 2 × 100 pb. The libraries were sequenced on 14 different lanes, 6 samples per lane randomly selected as indicated in Table 3. Numbers of raw reads are shown in Table 1 with an average 56.1 ± 1.6 M of reads per sample.

The reads were of good quality (quality scores above 28) as controlled using FastQC (http://www.bioinformatics.babraham.ac.uk/projects/fastqc/).

**Ethics Statement**

Liver samples were collected in a previous study [3]. They were reused later for RNA extraction and sequencing as described in this data paper, thus complying with the “reduce” recommendation of the 3R rules [4]. The animal experiments (number C22 237) were performed in accordance with the EU Directive 2010/63/EU for animal experiments. Animal experiments also complied with the ARRIVE guidelines [5].

**CRediT Author Statement**

Frédéric Hérault: Conceptualization, Methodology, Formal analysis, Resources. Elisabeth Baéza: Conceptualization, Resources. Christian Diot: Conceptualization, Methodology, Supervision, Project administration, Writing- Original draft and Funding acquisition.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

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