

## ***Supplementary Material***

### **Progressive Microstructural Deterioration Dictates Evolving Biomechanical Dysfunction in the Marfan Aorta**

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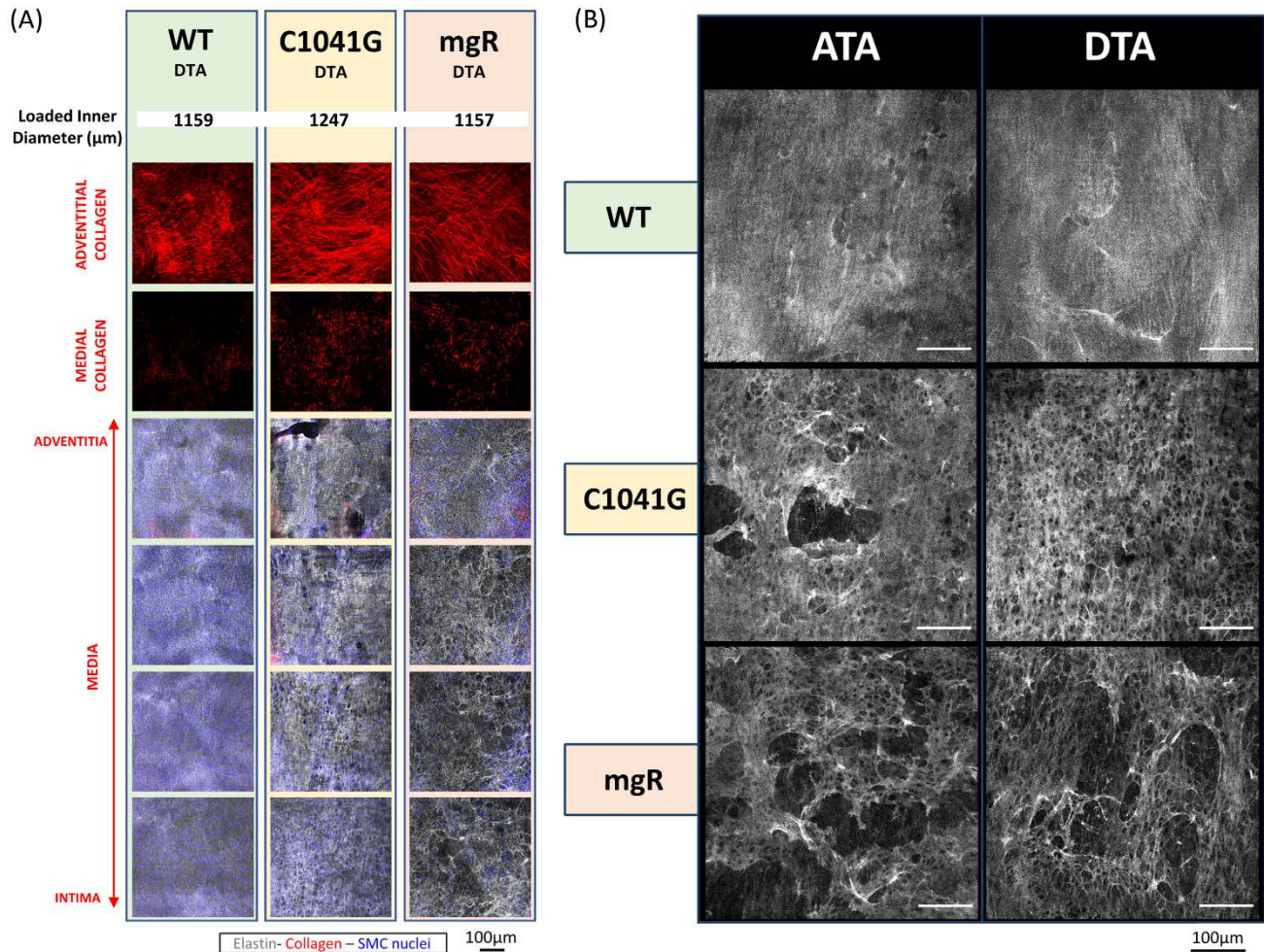
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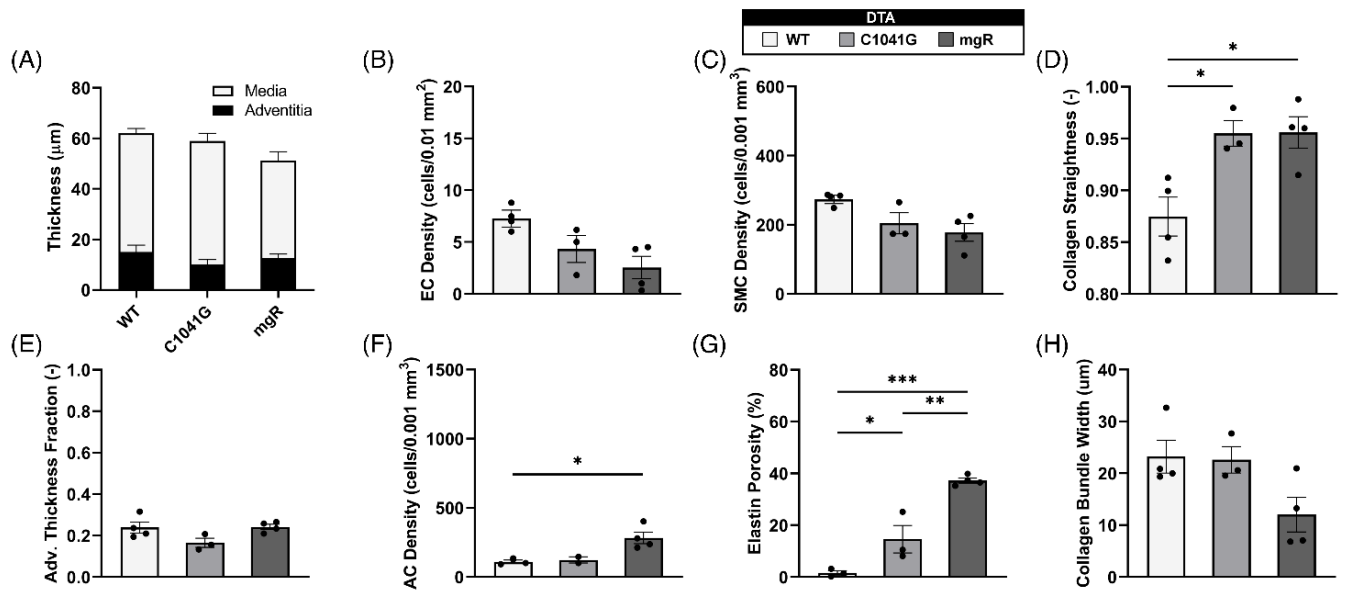
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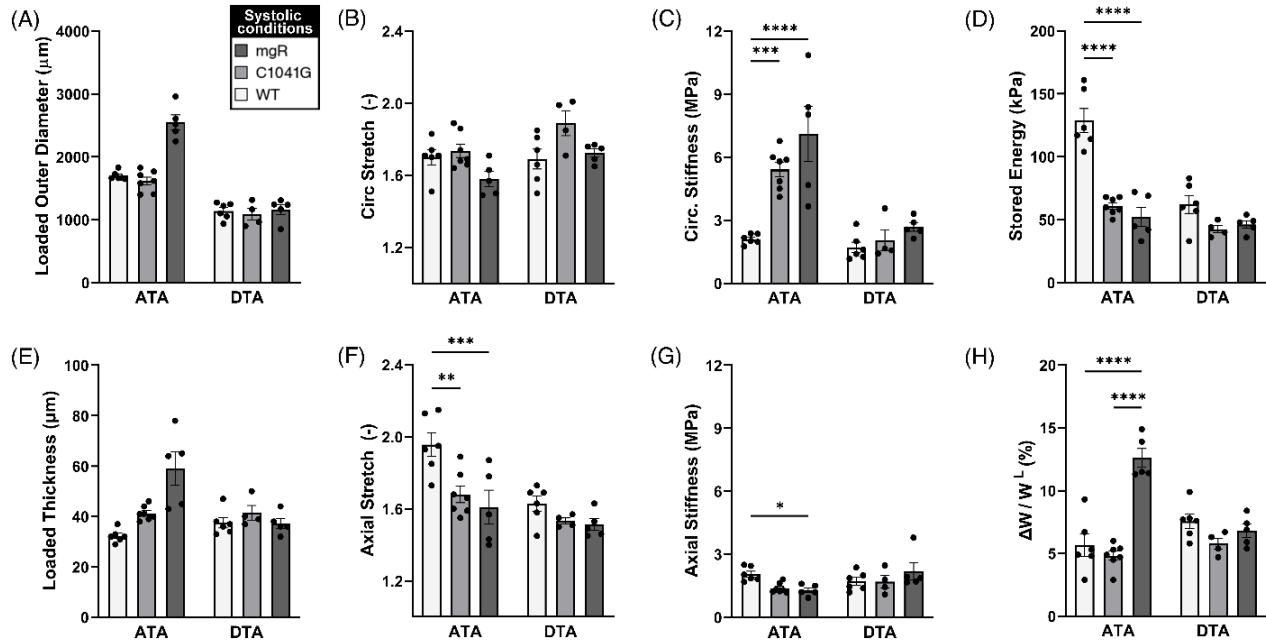
## 1.1 Supplementary Figures



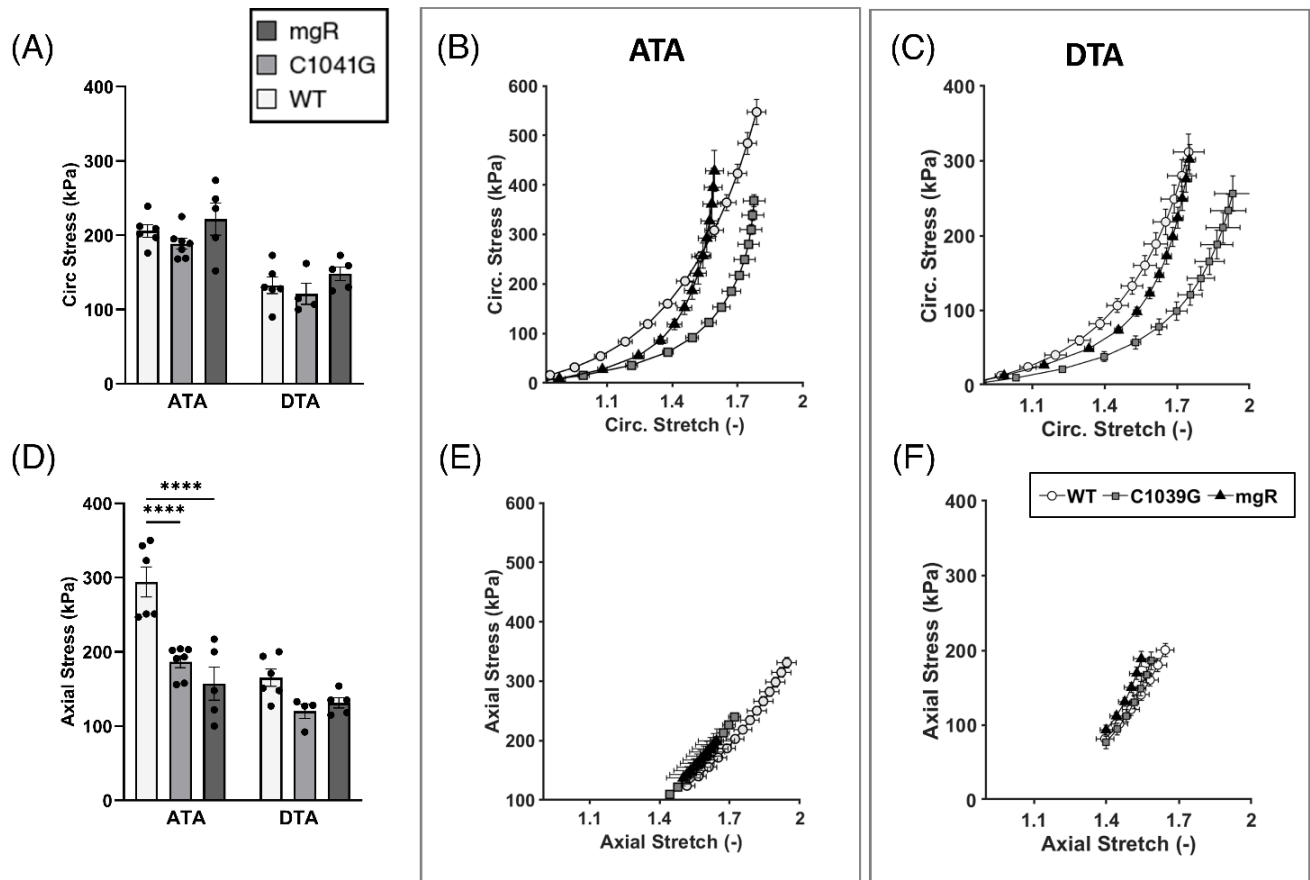
**Supplementary Figure 1.** (A) Mosaic of representative images from multiphoton microscopy of the descending thoracic aorta (DTA): one wild-type (WT), *Fbn1*<sup>C1041G/+</sup> (C1041G), and *Fbn1*<sup>mgR/mgR</sup> (mgR) mouse each, from left-to-right. Note that the images were collected ex vivo under in vivo relevant diastolic conditions, namely, at an 80-mmHg distending pressure and specimen-specific in vivo value of axial stretch. Shown from top-to-bottom, adventitial then medial fibrillar collagen (red, via second harmonic generation) and four equally spaced medial elastin volumes (gray, two-photon fluorescence images), the latter with superimposed cell nuclei (blue) which mask, in part, the underlying detail on the elastin but are critical to compare given the marked loss of cells in the Marfan aortas in addition to the increased porosity of the elastic structures. Compare with Figure 1 in the main text, which shows similar findings for the ascending thoracic aorta (ATA). (B) Higher magnification of elastin images, sectioned at half thickness of the medial layer for one representative sample of each group and region (ATA on the left, DTA on the right) of the thoracic aorta, shows more clearly the general deterioration of the elastin architecture from the WT to the C1041G to the mgR mice (top to bottom).



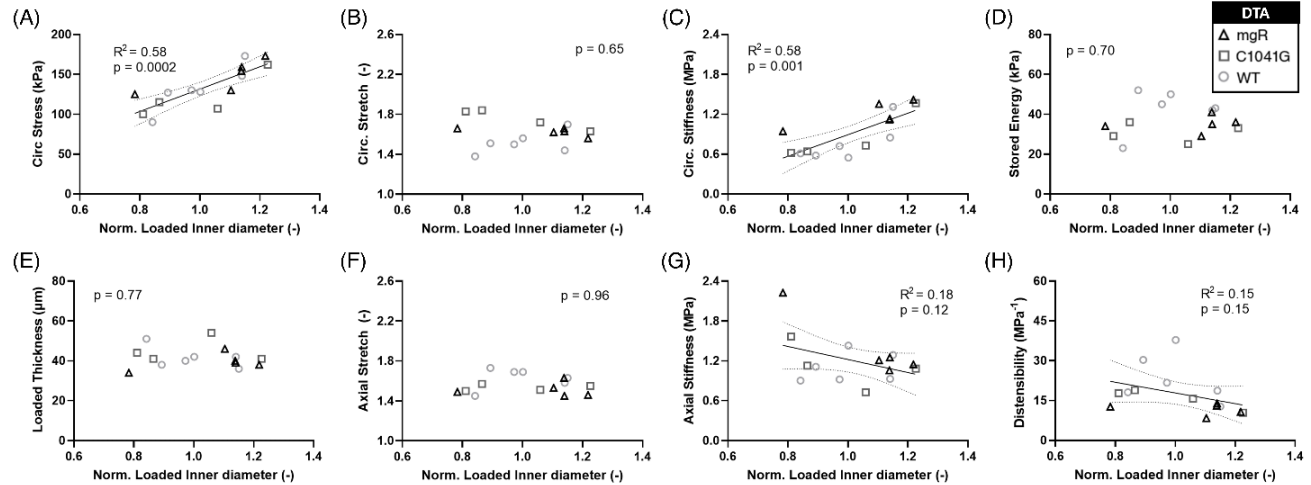
**Supplementary Figure 2.** Multiple microstructural metrics for the descending thoracic aorta (DTA) plotted as a function of genotype: WT ( $n=4$ ), C1041G ( $n=3$ ), and mgR ( $n=4$ ). Included are (A) medial and adventitial thicknesses, and (E) their ratio, plus (B, C, F) layer-specific cell densities based on cell nuclei and associated areas or volumes as well as (G) elastin porosity and (D, H) two measures of collagen fiber structure (straightness and fiber bundle width). Data are shown as mean  $\pm$  SEM, with \*  $p < 0.05$ .



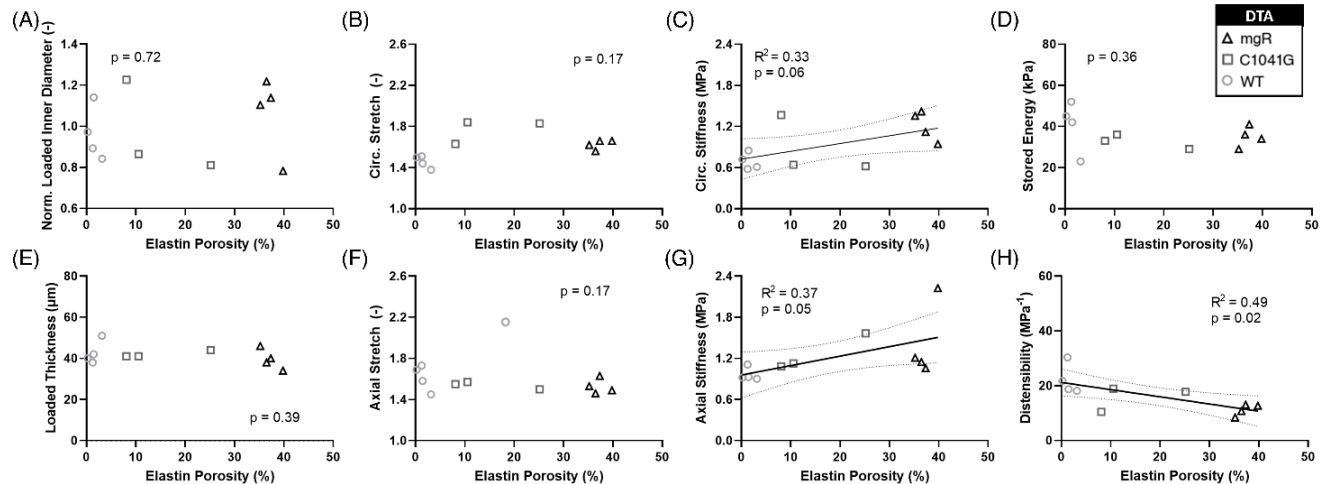
**Supplementary Figure 3.** Multiple geometric and mechanical metrics derived from computer-controlled biaxial testing of passive ascending (ATA) and descending (DTA) thoracic aortas calculated under systolic conditions (120 mmHg and specimen-specific axial stretches) for all three genotypes: WT ( $n=6$  for the ATA and 6 for the DTA), C1041G ( $n=7$  and 4), and mgR ( $n=5$  and 5). Note the similar trends for the two aortic segments, though more severe in the ascending aorta. In particular, there was a marked increase in (A) diameter and (E) wall thickness, a marked decrease in (F) axial stretch and (D) energy storage, and a marked increase in (C) circumferential material stiffness and (H) energy dissipation in the ascending aorta from WT to C1041G to mgR mice, that is, with increasing dilatation (recall Figure 1). Less clear trends were observed for (B) circumferential stretch, (G) axial stiffness, and the mechanical data in the descending thoracic aorta. Data are shown as mean  $\pm$  SEM, with \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$  and \*\*\*\*  $p < 0.0001$ .



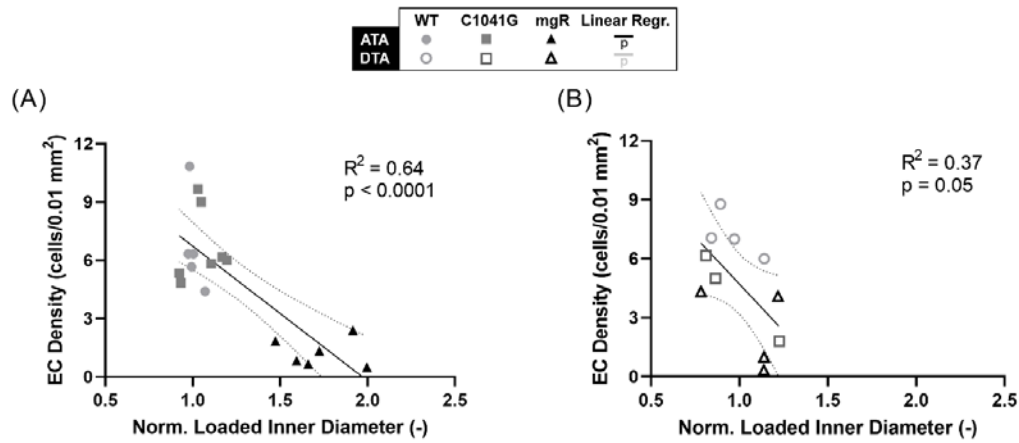
**Supplementary Figure 4.** Biaxial wall stress (A, D) derived from computer-controlled biaxial testing of passive ascending and descending thoracic aortas and calculated under diastolic conditions (80 mmHg and specimen-specific axial stretches) for all three genotypes: WT, C1041G, and mgR. Shown, too, are associated biaxial Cauchy stress (actual force per actual oriented area) – stretch curves for (B, E) ascending and (C, F) descending thoracic aorta, which reflect the material behavior at different levels of distension and extension. Data are shown as mean  $\pm$  SEM, with \*\*\*\*  $p < 0.0001$ .



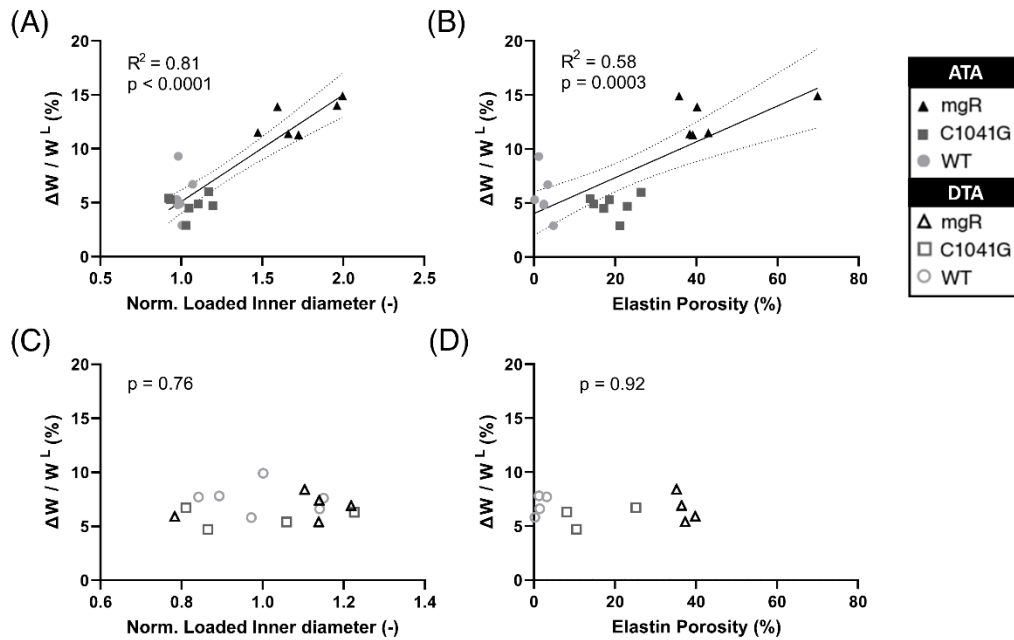
**Supplementary Figure 5.** Plots of specimen-specific geometric and mechanical metrics for the descending thoracic aorta (DTA) vs. normalized diameter, all calculated at in vivo relevant diastolic conditions of 80 mmHg and specimen-specific axial stretch, for each genotype: WT ( $n=6$  - circles), C1041G ( $n=4$  - squares), and mgR ( $n=5$  - triangles). The data were fit by linear regression, with the best-fit line and 95% confidence intervals (solid and dotted lines, respectively) shown when the slope was nonzero or showed a nearly significant trend.



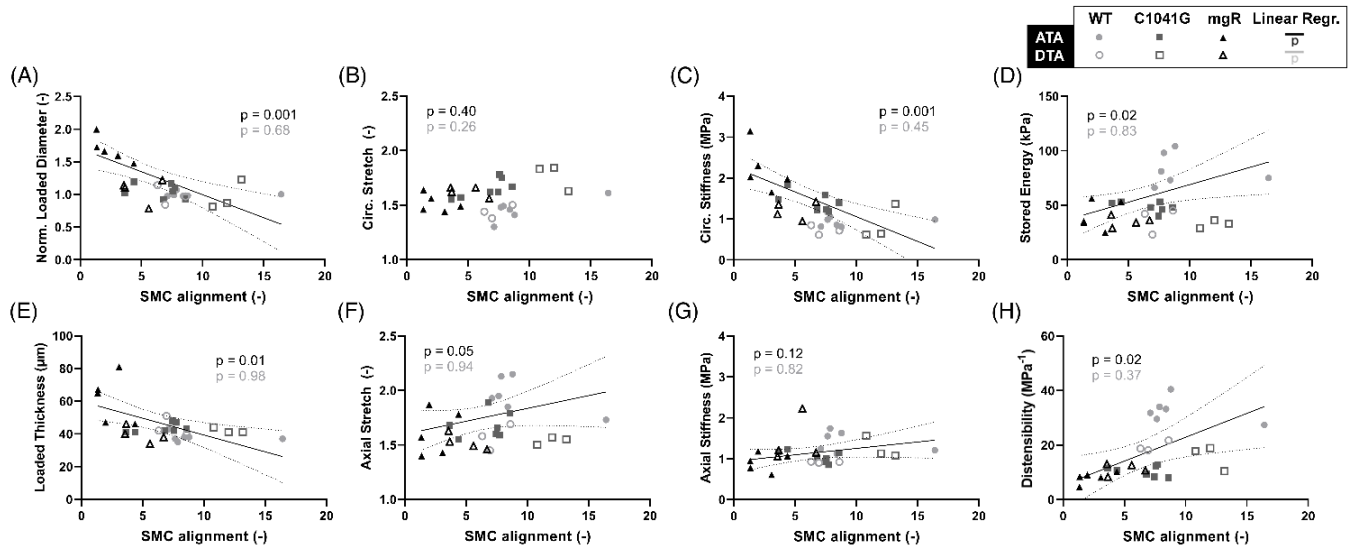
**Supplementary Figure 6.** Plots of specimen-specific geometric and mechanical metrics for the descending thoracic aorta (DTA) vs. elastin porosity, all calculated at in vivo relevant diastolic conditions of 80 mmHg and specimen-specific axial stretch, for each genotype: WT ( $n=4$ ), C1041G ( $n=3$ ), and mgR ( $n=4$ ). The data were fit by linear regression, with the best-fit line and 95% confidence intervals (solid and dotted lines, respectively) shown when the slope was nonzero or showed a nearly significant trend.



**Supplementary Figure 7.** Plots of specimen-specific endothelial cell density based on cell nuclei and associated areas vs. specimen-specific normalized inner diameter for (A) the ascending (ATA, solid markers) and (B) descending (DTA, open symbols) thoracic aorta, all calculated at in vivo relevant diastolic conditions of 80 mmHg and specimen-specific axial stretch for each genotype: WT (circles), C1041G (squares), and mgR (triangles). The data were fit by linear regression, with the best-fit line and 95% confidence intervals (solid and dotted lines, respectively).



**Supplementary Figure 8.** Plots of specimen-specific energy dissipation (that is, energy lost during cyclic loading, inferred as the difference between elastic energy gained upon loading and elastic energy retained during unloading) vs. specimen-specific (A, B) diameter and (C, D) elastin porosity for the ascending (ATA) and descending (DTA) thoracic aorta for all three genotypes. The data were fit by linear regression, with the best-fit line and 95% confidence intervals (solid and dotted lines, respectively) shown when the slope was nonzero or showed a nearly significant trend.



**Supplementary Figure 9.** Plots of specimen-specific geometric and mechanical metrics vs. smooth muscle cell alignment for the ascending (ATA, solid markers) and descending (DTA, open symbols) thoracic aorta. The data were fit by linear regression, with the best-fit line and 95% confidence intervals (solid and dotted lines, respectively) shown when the slope was nonzero or showed a nearly significant trend.

## 1.2 Supplementary Tables

**Supplementary Table 1.** Geometric and mechanical metrics for the three genotypes (WT, C1041G, mgR) for the ascending (ATA) and the descending (DTA) thoracic aorta. Values are mean  $\pm$  SEM. Pressure values (P) are given in mmHg.

|                                                              | ATA – at Diastolic Pressure                                  |              |          |              |          |              | DTA – at Diastolic Pressure |              |          |              |          |              |        |
|--------------------------------------------------------------|--------------------------------------------------------------|--------------|----------|--------------|----------|--------------|-----------------------------|--------------|----------|--------------|----------|--------------|--------|
|                                                              | WT                                                           |              | C1041G   |              | mgR      |              | WT                          |              | C1041G   |              | mgR      |              |        |
|                                                              | <i>n</i>                                                     | = 6          | <i>n</i> | = 7          | <i>n</i> | = 6          | <i>n</i>                    | = 6          | <i>n</i> | = 4          | <i>n</i> | = 5          |        |
| Unloaded dimensions                                          |                                                              |              |          |              |          |              |                             |              |          |              |          |              |        |
| Wall Thickness (μm)                                          | 107                                                          | ± 1.8        | 120      | ± 4.6        | 146      | ± 7.8        | 102                         | ± 2.2        | 120      | ± 7.3        | 97       | ± 5.9        |        |
| Outer Diameter (μm)                                          | 1129                                                         | ± 28         | 1077     | ± 40         | 1801     | ± 101        | 800                         | ± 28         | 726      | ± 72         | 796      | ± 55         |        |
| Axial Length (mm)                                            | 2.15                                                         | ± 0.14       | 2.73     | ± 0.12       | 3.57     | ± 0.10       | 3.54                        | ± 0.29       | 3.94     | ± 0.60       | 4.95     | ± 0.39       |        |
| Loaded dimensions                                            | <b>P</b>                                                     | <b>= 80</b>  | <b>P</b> | <b>= 80</b>  | <b>P</b> | <b>= 80</b>  | <b>P</b>                    | <b>= 80</b>  | <b>P</b> | <b>= 80</b>  | <b>P</b> | <b>= 80</b>  |        |
| Outer Diameter (μm)                                          | 1523                                                         | ± 19.9       | 1617     | ± 59.2       | 2569     | ± 130.8      | 1099                        | ± 50.1       | 1096     | ± 97.4       | 1173     | ± 79.1       |        |
| Wall Thickness (μm)                                          | 38                                                           | ± 1.1        | 43       | ± 1.1        | 61       | ± 6.7        | 42                          | ± 2.1        | 45       | ± 3.0        | 39       | ± 1.9        |        |
| Inner Radius (μm)                                            | 794                                                          | ± 12.1       | 794      | ± 30.5       | 1256     | ± 60.9       | 543                         | ± 26.2       | 528      | ± 47.7       | 567      | ± 39.7       |        |
| <i>In vivo</i> Axial Stretch (λ <sub>z</sub> <sup>iv</sup> ) | 1.96                                                         | ± 0.07       | 1.68     | ± 0.05       | 1.61     | ± 0.09       | 1.63                        | ± 0.04       | 1.53     | ± 0.02       | 1.51     | ± 0.03       |        |
| <i>In vivo</i> Circumferential Stretch (λ <sub>θ</sub> )     | 1.46                                                         | ± 0.04       | 1.65     | ± 0.03       | 1.52     | ± 0.04       | 1.51                        | ± 0.04       | 1.75     | ± 0.05       | 1.63     | ± 0.02       |        |
| Diastolic Cauchy Stresses (kPa)                              |                                                              |              |          |              |          |              |                             |              |          |              |          |              |        |
| Circumferential, σ <sub>θ</sub>                              | 206                                                          | ± 8.4        | 188      | ± 7.4        | 222      | ± 21.3       | 133                         | ± 11.1       | 121      | ± 14.1       | 148      | ± 9.0        |        |
| Axial, σ <sub>z</sub>                                        | 294                                                          | ± 20.3       | 187      | ± 7.9        | 157      | ± 22.4       | 165                         | ± 11.6       | 120      | ± 9.4        | 131      | ± 7.0        |        |
| Diastolic Linearized Stiffness (MPa)                         |                                                              |              |          |              |          |              |                             |              |          |              |          |              |        |
| Circumferential, C <sub>q<sub>q</sub>q<sub>q</sub></sub>     | 0.92                                                         | ± 0.04       | 1.42     | ± 0.09       | 2.22     | ± 0.25       | 0.77                        | ± 0.12       | 0.84     | ± 0.18       | 1.19     | ± 0.09       |        |
| Axial, C <sub>z<sub>z</sub>z<sub>z</sub></sub>               | 1.45                                                         | ± 0.07       | 2.69     | ± 0.36       | 3.85     | ± 0.67       | 1.10                        | ± 0.90       | 1.13     | ± 0.17       | 1.38     | ± 0.21       |        |
| Diastolic Stored Energy (kPa)                                | 83                                                           | ± 6.1        | 49       | ± 1.8        | 41       | ± 6.0        | 42                          | ± 4.3        | 31       | ± 2.4        | 35       | ± 1.9        |        |
| Distensibility (1/MPa)                                       | 32.76                                                        | ± 1.83       | 10.49    | ± 0.73       | 8.09     | ± 0.93       | 23.26                       | ± 3.75       | 15.72    | ± 1.89       | 11.74    | ± 0.99       |        |
| % ΔW / W <sup>L</sup>                                        | 5.6                                                          | ± 0.9        | 4.8      | ± 0.4        | 12.6     | ± 0.8        | 6.6                         | ± 7.7        | 5.4      | ± 6.7        | 5.4      | ± 6.9        |        |
|                                                              | ATA – at Systolic Pressure                                   |              |          |              |          |              | DTA – at Systolic Pressure  |              |          |              |          |              |        |
|                                                              | WT                                                           |              | C1041G   |              | mgR      |              | WT                          |              | C1041G   |              | mgR      |              |        |
|                                                              | <i>n</i>                                                     | = 6          | <i>n</i> | = 7          | <i>n</i> | = 6          | <i>n</i>                    | = 6          | <i>n</i> | = 4          | <i>n</i> | = 5          |        |
|                                                              | <b>P</b>                                                     | <b>= 120</b> | <b>P</b> | <b>= 120</b> | <b>P</b> | <b>= 120</b> | <b>P</b>                    | <b>= 120</b> | <b>P</b> | <b>= 120</b> | <b>P</b> | <b>= 120</b> |        |
|                                                              | Outer Diameter (μm)                                          | 1766         | ± 27.1   | 1699         | ± 63.8   | 2667         | ± 124.0                     | 1215         | ± 51.4   | 1172         | ± 95.9   | 1237         | ± 83.1 |
|                                                              | Wall Thickness (μm)                                          | 32           | ± 1.0    | 41           | ± 1.1    | 59           | ± 6.5                       | 37           | ± 2.0    | 42           | ± 2.8    | 37           | ± 2.0  |
|                                                              | Inner Radius (μm)                                            | 850          | ± 14.3   | 808          | ± 31.6   | 1275         | ± 59.7                      | 570          | ± 26.8   | 544          | ± 47.2   | 581          | ± 40.6 |
|                                                              | <i>In vivo</i> Axial Stretch (λ <sub>z</sub> <sup>iv</sup> ) | 1.96         | ± 0.07   | 1.68         | ± 0.05   | 1.61         | ± 0.09                      | 1.63         | ± 0.04   | 1.53         | ± 0.02   | 1.51         | ± 0.03 |
|                                                              | <i>In vivo</i> Circumferential Stretch (λ <sub>θ</sub> )     | 1.70         | ± 0.04   | 1.74         | ± 0.04   | 1.58         | ± 0.04                      | 1.69         | ± 0.06   | 1.89         | ± 0.07   | 1.72         | ± 0.02 |
|                                                              | Systolic Cauchy Stresses (kPa)                               |              |          |              |          |              |                             |              |          |              |          |              |        |
|                                                              | Circumferential, σ <sub>θ</sub>                              | 423          | ± 18.7   | 315          | ± 13.2   | 361          | ± 35.5                      | 249          | ± 19.0   | 211          | ± 20.7   | 250          | ± 16.0 |
|                                                              | Axial, σ <sub>z</sub>                                        | 395          | ± 24.8   | 233          | ± 10.1   | 206          | ± 27.6                      | 221          | ± 17.8   | 165          | ± 12.4   | 183          | ± 7.5  |
|                                                              | Systolic Linearized Stiffness (MPa)                          |              |          |              |          |              |                             |              |          |              |          |              |        |
|                                                              | Circumferential, C <sub>q<sub>q</sub>q<sub>q</sub></sub>     | 2.11         | ± 0.10   | 5.42         | ± 0.36   | 7.13         | ± 1.31                      | 1.71         | ± 0.25   | 2.06         | ± 0.51   | 2.68         | ± 0.20 |
| Axial, C <sub>z<sub>z</sub>z<sub>z</sub></sub>               | 2.06                                                         | ± 0.14       | 1.39     | ± 0.09       | 1.29     | ± 0.12       | 1.71                        | ± 0.18       | 1.70     | ± 0.29       | 2.20     | ± 0.40       |        |
| Systolic Stored Energy (kPa)                                 | 129                                                          | ± 9.5        | 61       | ± 2.6        | 52       | ± 7.8        | 62                          | ± 7.2        | 42       | ± 2.9        | 46       | ± 3.0        |        |

**Supplementary Table 2.** Average best-fit material parameters for the four-fiber family constitutive model determined via nonlinear regression for the three genotypes (WT, C1041G, mgR) for the ascending (ATA) and descending (DTA) thoracic aorta. Data are presented as mean  $\pm$  SEM values.

|     |        | Elastic Fibers   | Axial Collagen   |                 | Circ. Collagen + SMC    |                         | Symmetric Diagonal Collagen |                 |                  | Error             |
|-----|--------|------------------|------------------|-----------------|-------------------------|-------------------------|-----------------------------|-----------------|------------------|-------------------|
|     |        | $c$ (kPa)        | $c_1^1$ (kPa)    | $c_2^1$         | $c_1^2$ (kPa)           | $c_2^2$                 | $c_1^{3,4}$ (kPa)           | $c_2^{3,4}$     | $\alpha_o$ (deg) | $RMSE$            |
| ATA | WT     | 20.39 $\pm$ 4.11 | 4.88 $\pm$ 2.11  | 0.26 $\pm$ 0.26 | 25.45 $\pm$ 4.23        | 2.90E-10 $\pm$ 2.74E-10 | 14.25 $\pm$ 1.87            | 0.16 $\pm$ 0.02 | 46.87 $\pm$ 0.76 | 0.102 $\pm$ 0.004 |
|     | C1041G | 14.90 $\pm$ 2.94 | 6.51 $\pm$ 0.89  | 0.09 $\pm$ 0.03 | 3.10E-05 $\pm$ 2.54E-05 | 3.67 $\pm$ 0.33         | 7.63 $\pm$ 0.20             | 0.44 $\pm$ 0.07 | 50.92 $\pm$ 1.11 | 0.080 $\pm$ 0.003 |
|     | mgR    | 15.91 $\pm$ 1.84 | 1.97 $\pm$ 0.50  | 1.07 $\pm$ 0.75 | 3.34E-05 $\pm$ 2.08E-05 | 8.74 $\pm$ 1.23         | 9.35 $\pm$ 1.65             | 0.92 $\pm$ 0.17 | 54.86 $\pm$ 1.12 | 0.147 $\pm$ 0.012 |
| DTA | WT     | 17.00 $\pm$ 4.16 | 11.59 $\pm$ 4.01 | 0.15 $\pm$ 0.10 | 15.99 $\pm$ 2.83        | 0.10 $\pm$ 0.04         | 4.40 $\pm$ 1.36             | 0.65 $\pm$ 0.07 | 41.08 $\pm$ 2.23 | 0.081 $\pm$ 0.002 |
|     | C1041G | 11.05 $\pm$ 1.72 | 6.72 $\pm$ 2.69  | 0.77 $\pm$ 0.38 | 3.68 $\pm$ 1.32         | 0.90 $\pm$ 0.85         | 2.16 $\pm$ 1.15             | 0.83 $\pm$ 0.14 | 40.11 $\pm$ 3.93 | 0.091 $\pm$ 0.004 |
|     | mgR    | 21.19 $\pm$ 1.67 | 2.39 $\pm$ 2.03  | 1.67 $\pm$ 0.52 | 4.53 $\pm$ 1.78         | 0.29 $\pm$ 0.09         | 2.19 $\pm$ 1.30             | 1.44 $\pm$ 0.35 | 41.72 $\pm$ 2.87 | 0.082 $\pm$ 0.003 |

**Supplementary Table 3.** Sample-specific diameter and best-fit material parameters for the four-fiber family constitutive model determined via nonlinear regression for the three genotypes (WT, C1041G, mgR) for the ascending (ATA) and descending (DTA) thoracic aorta. Diameter values are reported at the unloaded configuration and at *in vivo* relevant diastolic conditions of 80 mmHg (the latter also normalized for the average diameter of the WT group).

|     |        |          | Sample Diameter              |                            |                                     | Material Parameters |                |          |                      |          |                             |             |             |       |
|-----|--------|----------|------------------------------|----------------------------|-------------------------------------|---------------------|----------------|----------|----------------------|----------|-----------------------------|-------------|-------------|-------|
|     |        |          | Unloaded Inner Diameter (μm) | Loaded Inner Diameter (μm) | Normalized Loaded Inner Diameter(-) | Elastic Fibers      | Axial Collagen |          | Circ. Collagen + SMC |          | Symmetric Diagonal Collagen |             |             | Error |
|     |        |          |                              |                            |                                     | $c$ (kPa)           | $c_1^1$ (kPa)  | $c_2^1$  | $c_1^2$ (kPa)        | $c_2^2$  | $c_1^{3,4}$ (kPa)           | $c_2^{3,4}$ | $a_o$ (deg) | RMSE  |
| ATA | WT     | WT 1     | 1030                         | 1526                       | 1.00                                | 24.10               | 10.99          | 2.24E-14 | 12.51                | 1.40E-12 | 9.73                        | 0.25        | 45.35       | 0.091 |
|     |        | WT 2     | 1146                         | 1497                       | 0.98                                | 34.05               | 9.05E-12       | 1.56     | 28.61                | 1.66E-09 | 8.57                        | 0.13        | 44.68       | 0.114 |
|     |        | WT 3     | 1222                         | 1495                       | 0.98                                | 22.88               | 1.25E-08       | 0.01     | 41.55                | 7.79E-11 | 17.85                       | 0.20        | 47.53       | 0.091 |
|     |        | WT 4     | 1177                         | 1620                       | 1.06                                | 14.02               | 3.58           | 2.22E-14 | 30.98                | 2.22E-14 | 13.60                       | 0.10        | 46.88       | 0.113 |
|     |        | WT 5     | 1102                         | 1511                       | 0.99                                | 4.49                | 11.54          | 2.39E-14 | 19.82                | 2.39E-14 | 20.33                       | 0.12        | 49.97       | 0.102 |
|     |        | WT 6     | 1097                         | 1492                       | 0.98                                | 22.82               | 3.16           | 3.51E-14 | 19.21                | 2.22E-14 | 15.42                       | 0.17        | 46.81       | 0.100 |
|     | C1041G | C1041G 1 | 1199                         | 1787                       | 1.17                                | 13.44               | 4.96           | 2.28E-03 | 2.43E-07             | 5.10     | 7.64                        | 0.56        | 50.23       | 0.096 |
|     |        | C1041G 2 | 1085                         | 1571                       | 1.03                                | 21.74               | 5.50           | 0.13     | 2.47E-05             | 4.18     | 7.93                        | 0.57        | 52.66       | 0.072 |
|     |        | C1041G 3 | 1220                         | 1812                       | 1.19                                | 28.53               | 6.33           | 0.22     | 1.82E-04             | 3.16     | 7.68                        | 0.76        | 50.39       | 0.075 |
|     |        | C1041G 4 | 1052                         | 1602                       | 1.05                                | 11.44               | 9.49           | 0.03     | 4.97E-08             | 2.70     | 8.16                        | 0.26        | 47.80       | 0.083 |
|     |        | C1041G 5 | 1064                         | 1694                       | 1.11                                | 14.66               | 3.68           | 0.14     | 1.07E-07             | 2.85     | 7.62                        | 0.34        | 47.01       | 0.084 |
|     |        | C1041G 6 | 975                          | 1434                       | 0.94                                | 7.12                | 10.03          | 0.04     | 6.80E-06             | 3.42     | 6.53                        | 0.32        | 53.25       | 0.076 |
|     |        | C1041G 7 | 962                          | 1420                       | 0.93                                | 7.39                | 5.61           | 0.04     | 2.89E-06             | 4.27     | 7.80                        | 0.28        | 55.08       | 0.074 |
|     | mgR    | mgR 1    | 1718                         | 2631                       | 1.73                                | 21.07               | 2.62           | 0.69     | 1.03E-11             | 6.76     | 4.65                        | 1.03        | 49.74       | 0.177 |
|     |        | mgR 2    | 1707                         | 2498                       | 1.64                                | 9.15                | 3.23           | 2.00E-06 | 2.21E-06             | 5.51     | 12.06                       | 0.40        | 56.59       | 0.121 |
|     |        | mgR 3    | 1582                         | 2224                       | 1.46                                | 13.67               | 2.26           | 5.09E-08 | 6.14E-09             | 9.87     | 15.10                       | 0.50        | 55.99       | 0.104 |
|     |        | mgR 4    | 1917                         | 2919                       | 1.92                                | 16.25               | 2.73           | 1.88E-08 | 9.81E-05             | 7.92     | 6.44                        | 1.01        | 57.50       | 0.163 |
|     |        | mgR 5    | 1821                         | 2469                       | 1.62                                | 20.67               | 0.96           | 0.99     | 1.93E-10             | 14.13    | 6.62                        | 1.54        | 54.59       | 0.147 |
|     |        | mgR 6    | 2175                         | 3021                       | 1.98                                | 14.66               | 0.00           | 4.73     | 1.00E-04             | 8.24     | 11.24                       | 1.04        | 54.76       | 0.173 |
| DTA | WT     | WT 1     | 928                          | 1243                       | 1.13                                | 31.47               | 1.42           | 0.54     | 12.91                | 0.24     | 4.58                        | 0.84        | 45.48       | 0.085 |
|     |        | WT 2     | 789                          | 1069                       | 0.97                                | 14.56               | 15.90          | 2.32E-14 | 20.45                | 2.33E-14 | 2.96                        | 0.59        | 46.63       | 0.075 |
|     |        | WT 3     | 759                          | 957                        | 0.87                                | 0.00                | 28.09          | 3.66E-14 | 25.20                | 0.13     | 10.92                       | 0.84        | 40.81       | 0.079 |
|     |        | WT 4     | 726                          | 984                        | 0.89                                | 20.61               | 10.75          | 2.34E-14 | 15.38                | 2.34E-14 | 3.12                        | 0.46        | 40.47       | 0.076 |
|     |        | WT 5     | 792                          | 1103                       | 1.00                                | 17.12               | 11.12          | 2.22E-14 | 17.18                | 2.45E-14 | 3.25                        | 0.45        | 31.17       | 0.082 |
|     | C1041G | C1041G 1 | 796                          | 1184                       | 1.08                                | 8.89                | 4.62           | 0.37     | 4.02                 | 0.12     | 2.42                        | 0.66        | 40.22       | 0.092 |
|     |        | C1041G 2 | 895                          | 1329                       | 1.21                                | 16.04               | 0.10           | 1.91     | 2.33E-14             | 3.44     | 5.30                        | 0.66        | 50.22       | 0.099 |
|     |        | C1041G 3 | 595                          | 912                        | 0.83                                | 8.67                | 11.64          | 0.51     | 4.46                 | 0.06     | 0.45                        | 1.24        | 31.08       | 0.081 |
|     |        | C1041G 4 | 618                          | 961                        | 0.87                                | 10.60               | 10.53          | 0.30     | 6.23                 | 1.26E-12 | 0.46                        | 0.78        | 38.90       | 0.092 |
|     | mgR    | mgR 1    | 831                          | 1238                       | 1.13                                | 22.94               | 0.27           | 0.80     | 2.54                 | 0.34     | 1.58                        | 0.76        | 42.62       | 0.084 |
|     |        | mgR 2    | 826                          | 1236                       | 1.12                                | 17.78               | 0.42           | 2.43     | 2.46                 | 0.33     | 7.27                        | 0.70        | 42.54       | 0.086 |
|     |        | mgR 3    | 904                          | 1315                       | 1.20                                | 26.73               | 0.06           | 3.34     | 11.03                | 1.10E-12 | 1.51                        | 1.57        | 46.96       | 0.071 |
|     |        | mgR 4    | 585                          | 864                        | 0.79                                | 18.05               | 10.49          | 0.60     | 5.55                 | 0.25     | 0.08                        | 2.60        | 30.78       | 0.086 |
|     |        | mgR 5    | 835                          | 1214                       | 1.10                                | 20.46               | 0.71           | 1.21     | 1.06                 | 0.54     | 0.51                        | 1.54        | 45.67       | 0.081 |