**Figure Legends:**

Figure 1: Longitudinal body mass (a), final body mass (b), percent body fat (c) and Modified Mankin Score (d) in diet-induced obesity prone (DIO-P) and resistant (DIO-R) rats and chow-fed control rats. Data are presented as Mean and 95% Confidence Interval for obesity prone (n=7), obesity resistant (n=7), and chow-fed control animals (n=11). In all panels, \* denotes a significant difference (p<0.05) between obesity prone versus obesity resistant and chow-fed control animals. # denotes a significant difference (p<0.05) with chow-fed control animals.

Figure 2: Medial Tibilal Plateau (MTP) Histological slides from one representative of an obesity prone (panel A; MTP score = 14, Total score = 53), obesity resistant (panel B; MTP score = 14, Total score = 47), and chow-fed control (panel C; MTP score = 3, Total score = 23) animal.

Table 1: Summary of Modified Mankin Score Criteria across groups. Obesity Prone (DIO-P) and Obesity Resistant (DIO-R) animals exhibited similar scores across all criteria. Both DIO-P and DIO-R animals had statistically higher medial tibial plateau (p=0.013) and femoral groove scores compared to chow animals (p=0.002). Both DIO-P and DIO-R had more severe total joint damage compared to chow animals (p<0.001). P<0.05 is indicated by \*, medians and minimum –maximum scores for all criteria are shown.

Table 2: Synovial fluid and serum inflammatory markers in diet-induced obese and chow control-diet fed control rats. P<0.05 is indicated by \*, data are presented as mean and 95% confidence interval (CI) of the mean.

Table 3: Summary of outputs from linear regression modeling estimating Modified Mankin Scores across all obese (DIO, n=14) and chow (n=6) animals. β-coefficients and predicted Modified Mankin Scores for each model are presented as mean and 95% confidence interval (CI) of the mean. R-squared (r2), F-statistics, standard error of the estimate, and p-value of the model are also provided.

Figure 3: Relative microbial abundance of 16S rRNA gene copies per 20 ng fecal DNA from chow-fed control (n=6), diet-induced obesity (n=14), obesity prone (n=7) and obesity resistant (n=7) animals.

Figure 4: Predicted Modified Mankin Score based on abundance of *Lactobacillus* spp. and *Methanobrevibacter* spp. plotted against the measured Modified Mankin Score for DIO (n=14) and LFD (n=6), r2=0.50.

Figure 5: Hypothesized interactions between diet, gut microbiota, low-grade chronic inflammation, and knee osteoarthritis. Bold arrows represent concepts with a strong body of evidence, non-bold arrows represent concepts with an emerging body of evidence, including data presented in these experiments, and dashed arrows highlight systemic factors beyond what has currently been shown or proposed that require further investigation.