# Using daily weights as an indicator of Gallus Gallus health and welfare in a research environment.

#### Abstract

During the course of infectious disease research at The Pirbright Institute, multiple parameters are used by animal technicians to assess the welfare of birds during disease progression. These have historically been subjective in nature, however a consistent, reproducible, quantitative measure of disease progression was desired. This study illustrates the initial results obtained from taking daily measurements of bird mass as a standard approach to assessing bird welfare. This includes the initial optimisation of the process, preliminary results from "normal" birds, and some immediate examples of how a review of daily weight gain has improved the early detection of avian health. Daily calibration, and separating bird weights according to sex allows background variation to be reduced. Daily weight gain assessment has also allowed early detection of ill health after infection with avian influenza to be detected, as well as an ability to differentiate procedure related from non-procedure related harms.

#### Introduction

Decreases in weight gain / weight loss are widely accepted signs of ill health (Enzien, 2008), however the majority of studies in chickens examining this do so by comparing a single time point post treatment, with a control group. For example, Gharaibeh (2008) observed a significant (P=0.004) weight decrease in a flock of broiler chickens infected with low pathogenic avian influenza (AIV) serotype H9N2 when compared to the uninfected control group. There is very little information examining daily weight gains in poultry in the context of infectious disease research.

## Materials and Methods

- Initially, birds were weighed daily from hatch by placing the scales on a flat surface, each bird gently picked up, its wing band number checked, then placed on the scales (Figure 1).
- The birds' weight is recorded on the weight recording sheet and then transferred onto an excel spreadsheet (Figure 2).
- Colour coding was added to highlight events such as regulated procedures.
- Due to initial results, however, we added the requirement of weighing a 100g calibration weight before each weighing bout to ensure the scales were reading accurately. If not the scales are adjusted until they do.
- This process is repeated for each bird. When working in an isolator, however, the calibration is checked after every bird due to the surface being uneven.



Figure 1: Weighing bird on scales accurate to 1g



Figure 2: Microsoft Excel spreadsheet containing raw data of bird weights. Each individual chickens' weight is plotted every day.



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	100g	100g	100g								
3	23/11/2018	24/11/2018	25/11/2018	26/11/2018	27/11/2018	28/11/2018	29/11/2018	30/11/2018	01/12/2018	02/12/2018	03/12/2018
	22 Days Old	23 Days Old	24 Days Old	25 Days Old	26 Days Old	27 Days Old	28 Days Old	29 Days Old	30 Days Old	31Days Old	32 Days Old
_	294	314	338	351	380	400	415	437	462	481	501
	234	514	330	331	300	400	415	431	402	401	301
	240	255	272	293	311	332	348	360	382	402	418
	274	287	305	327	364	371	396	407	429	444	468
	310	327	347	350	373	405	429	442	464	488	509
	510	JET	341	330	313	403	423	442	404	400	303
	281	300	322	341	360	378	402	410	428	455	474
	284	299	318	336	356	375	402	410	429	451	466
	329	356	377	408	434	460	485	501	524	554	573
						10.1	101		170	100	540
	287	300	319 281	346	374 318	404	431	449	472	498 396	516
	252	270	261	297	516	335	351	364	384	336	413
	301	317	337	350	379	407	422	440	460	488	500
	328	349	377	406	432	457	479	496	522	545	572
	228	240	253	267	286	305	317	333	350	370	395
	262	284	291	309	325	336	356	371	378	393	408
	264 241	278 258	299 264	314 278	329 295	349 306	370 336	380 343	398 358	420 373	437 389
	241	200	204	210	235	306	330	343	300	313	303
	273	289	302	320	345	360	381	394	420	415	445
	261	278	300	310	333	351	368	385	397	422	436
	308	327	347	368	395	418	441	461	487	516	538
	230	245	265	281	298	313	326	343	362	381	397
	230	24J	200	201	230	313	320	343	302	301	331
	278	297	321	343	363	382	402	424	445	464	492
	253	265	282	307	331	344	365	370	387	404	423
	240	256	265	275	297	308	323	337	350	368	378
_	240	256	265	275	297 413	308	323	337 481	350	368 524	378 556
_	259	273	293	307	333	353	367	378	394	524 410	424
			200		000	000		0.0		110	
	262	274	293	306	324	344	360	377	393	408	427

## Results

The results show the difference between non-calibrated scales and calibrated scales. Figure 3 shows a 400 large amount of variation when a calibration weight was not used  $\widehat{g}_{300}$ compared to Figure 4 where a 100g calibration weight was used prior to weighing the birds. There is still  $\overset{\circ}{\mathbb{S}}^{200}$ variation seen in Figure 4 but this 150 will be explored further in future studies.

Figure 5 demonstrates how the pathogenicity of a virus can be weight monitored using data. Between 23 and 25 days old a number of bird lost weight. The directly infected birds started showing weight loss one day before the contact birds. The infected birds reached their humane end point 600 within 2-3 days of the first observed weight loss and were then humanely 500 culled.

Figure 6 shows the difference between male and female weights and how ill health can be easily identified. The male bird (highlighted with red arrow) was found to have congenital heart failure. This male was the same weight as the lightest females in the group from the hatch date but then lost weight 1-2 days before he was culled.



Figure 3: Showing the variations of weight increases/ decreases as a result of using non-calibrated scales when weighing Dekalb White chickens.



#### Discussion

- By calibrating the weighing scales, the weight data is more accurate compared to not using calibrated scales. This is important because variation may hide information such as ill health and virus pathogenicity.
- Being able to predict the pathogenicity of a virus using weight data enables technicians and scientists to predict when an animal will reach its humane end point. When there are patterns in weight gain/loss that coincide with virus pathogenicity and other clinical signs, welfare can be improved by identifying the humane endpoint at an earlier stage. With further data, it is hoped that it will be possible to predict when the bird will show severe signs so it can be humanely culled to reduce pain, suffering, distress and lasting harm.
- Ill health not related to procedures and/or virus can also be identified using weight data. This is beneficial as an ill bird does not make a good study bird so this bird can be removed from the group before the study begins. Knowing male and female weights aids in identifying ill health as a healthy male bird should not be the same weight as a smaller female in the group.

# Weights of Rhode Island Red Chickens Infected with

#### **Future Studies**

- growth.

- sporadically handled.

#### Acknowledgments

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#### References

Enzien. E, (2008), Poultry Health & Management for the Small Flock, UNH Cooperative Extension, Pg 2 Gharaibeh.S, (2008), Pathogenicity of an Avian Influenza Virus Serotype H9N2 in Chickens, Avian Diseases, 52(1):106-110



Weights of Rhode Island Red Chickens using Calibrated Scales Figure 4: Showing the variations of weight increases/decreases when 100g calibration is used. Weights of Rhode Island Red Male and Female Chickens in an Infectious Bronchitis Virus study- Identifying ill health and the difference between male and female weights 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 Days Old Figure 6: Identification of ill health and the difference between male (blue) and female (orange) weights. The red arrow highlights a sick male bird. • Carry this study forward to gain more data for different breeds. • Look at ways to reduce the variation of the chicken weights. • Weigh the food enrichment to observe whether it has an effect on the rate of Look at correlations between various virus and weight increase/decrease. • Measure vocalisation and behaviour of the birds between regularly handled and