Three “Current Event” Items -

Racing Without Antibiotics
DNA Testing for Performance Genes
GPS Tracking

2017 Mt. St. Helens Combine Picnic
Gresham, Oregon

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FB Group: Racing Pigeon Forum

Overview

- Racing Without Antibiotics
  - Why Race Without Antibiotics?
  - Requirements for Excellent Health
  - Immunity in the Young Bird
  - Booster Vaccinations Really Help
  - Different Antibodies Have Different Half Lives
- DNA Testing for Performance Genes
  - LDHA
  - DRD4
- GPS Tracking
  - What REALLY Happened on One Race

Why Race Without Antibiotics?

- Antibiotics only work on a portion of the pathogen spectrum, so they aren't a very good prevention strategy anyway
  - Gram Positive antibiotics don't work on diseases caused by gram negative bacteria (and vise versa)
  - Antibiotics don't work at all on diseases caused by viruses
- Over use and misuse of antibiotics brings about resistant strains of bacteria
  - In 2016 a woman in Nevada died after becoming ill with an infection that was caused by a bacteria that was resistant to all 26 antibiotics available in the U.S.
  - Whether you agree or not, antibiotics are going to become increasingly difficult to obtain
- Antibiotics should be used only when needed for the treatment of a diagnosed condition

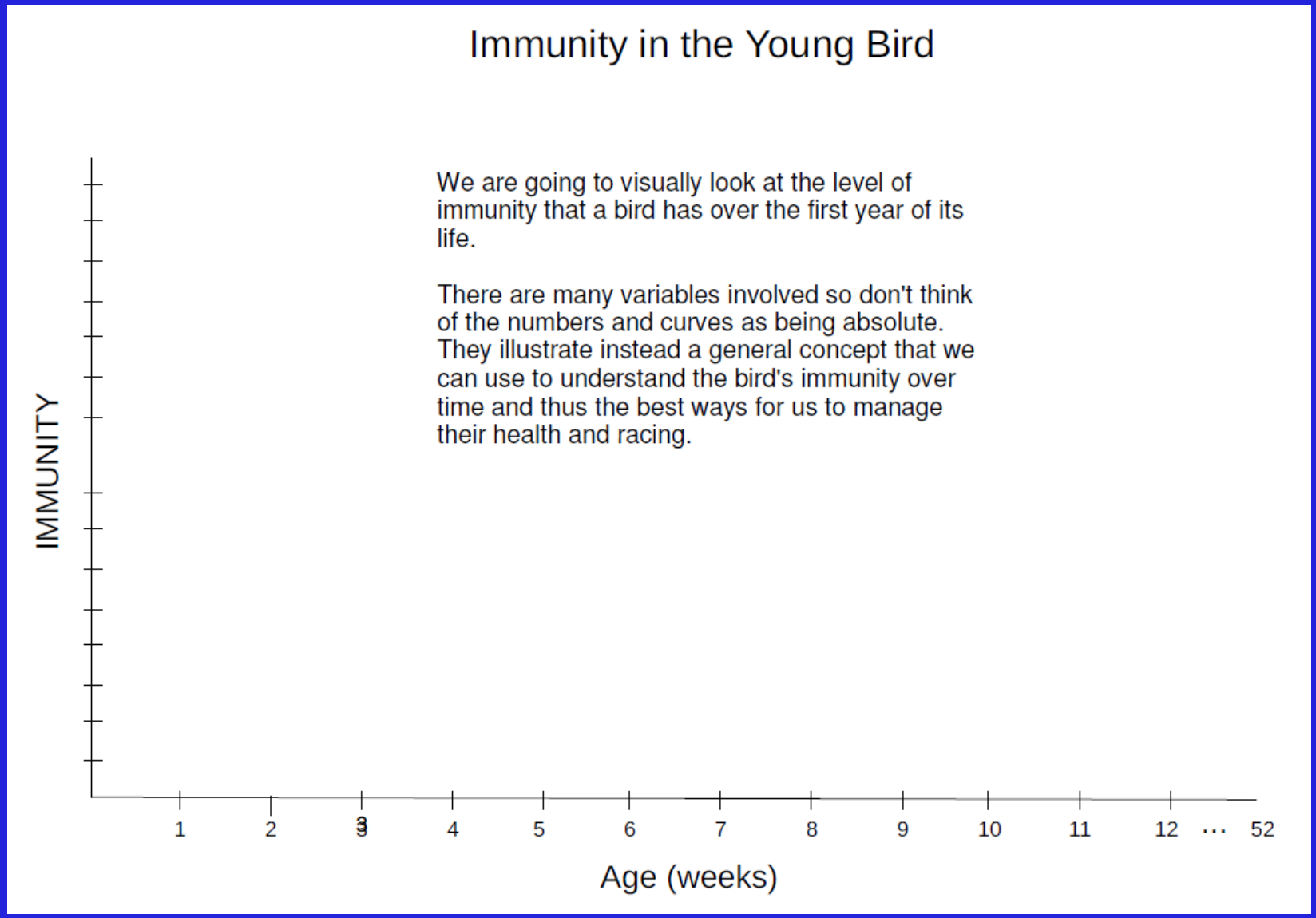
Requirements for Excellent Health

- Good nutrition with an adequate supply of:
  - Fats, Carbohydrates, Proteins
  - Vitamins
  - Minerals
  - Water
- Minimum of stress
  - No overcrowding
- Excellent ventilation
- Abundant exercise
- Parasite control

Requirements for Excellent Health

- **Balanced digestive tract**
  - Acidic water source
  - Use of prebiotics and probiotics
- **Robust immune system**
  - Stress actually suppresses the immune system
  - The immune system is stimulated by:
    - Exercise
    - A properly balanced digestive tract
  - Controlled exposure to common pathogens (e.g. deep litter)
  - Vaccinations
    - PMV, Paratyphoid, Circovirus, Herpes, Pox

Immunity in the Young Bird



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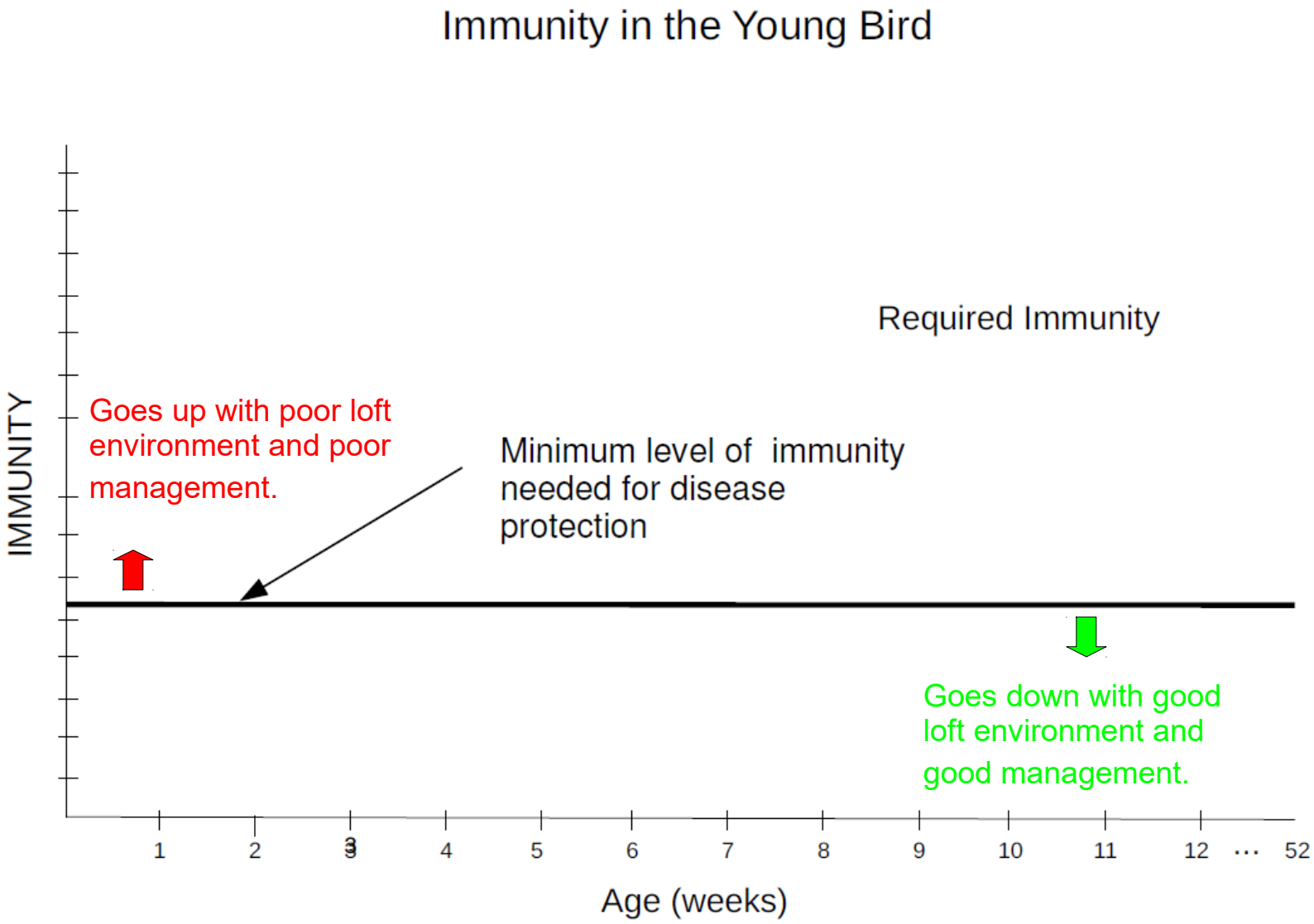

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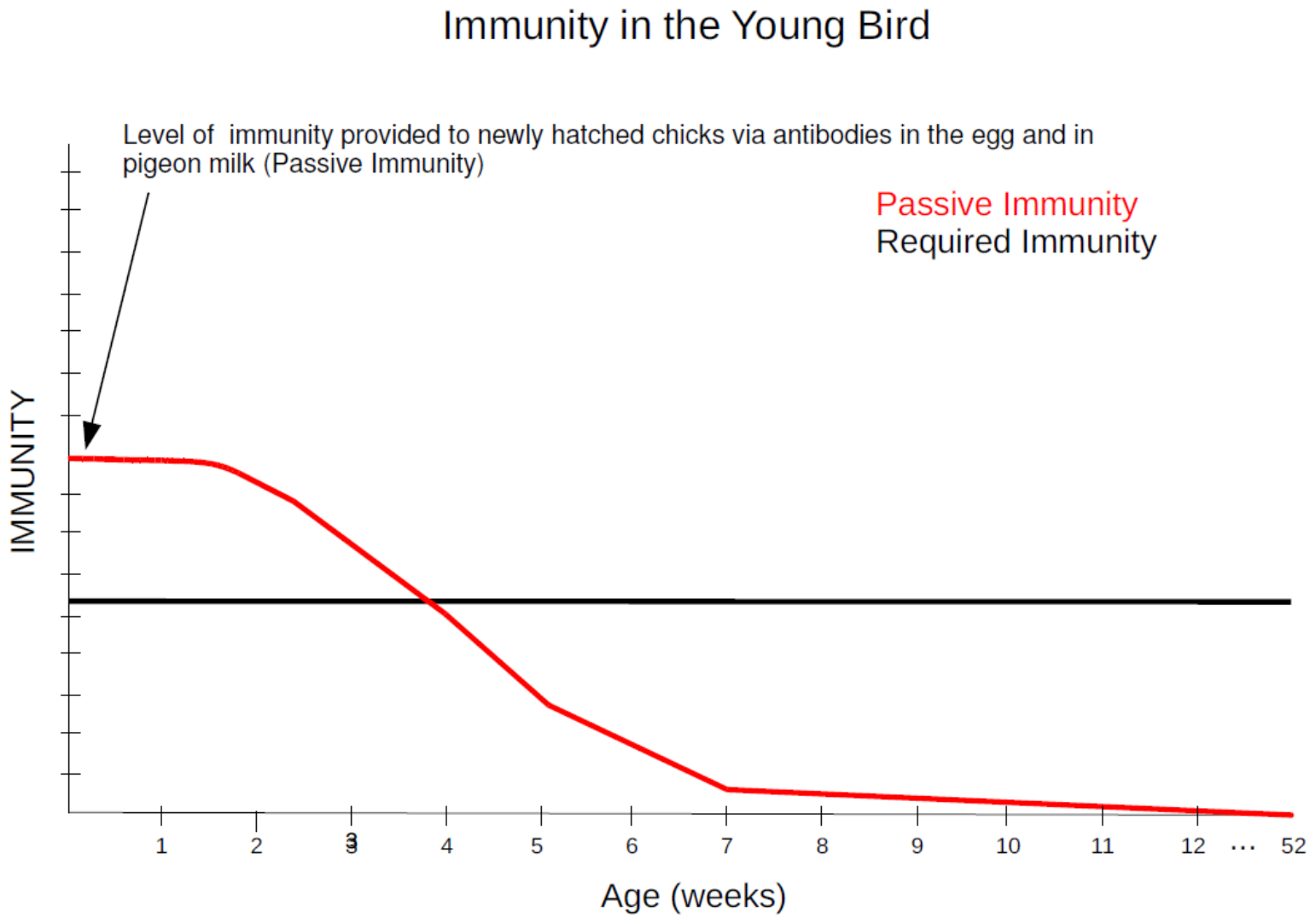

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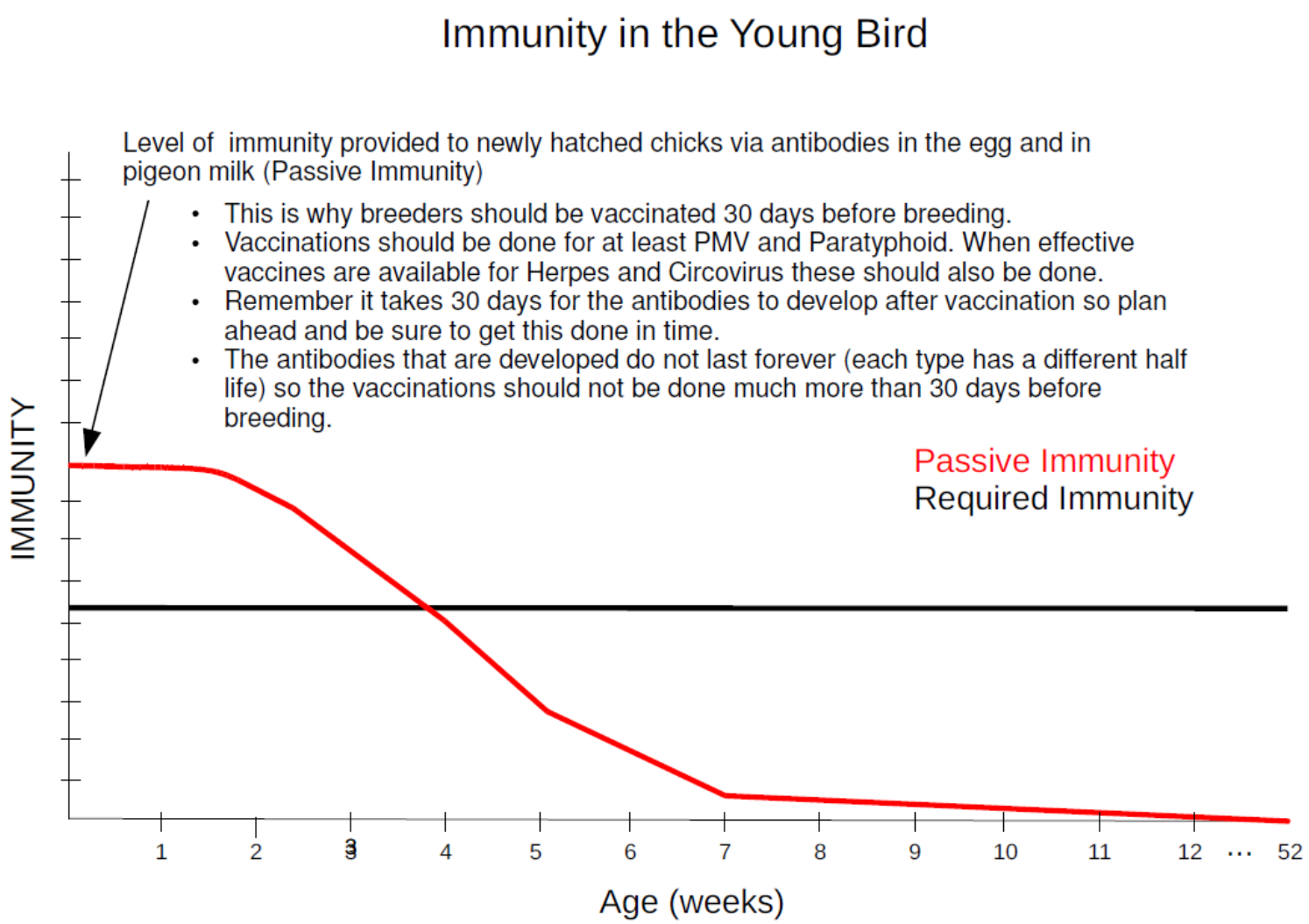

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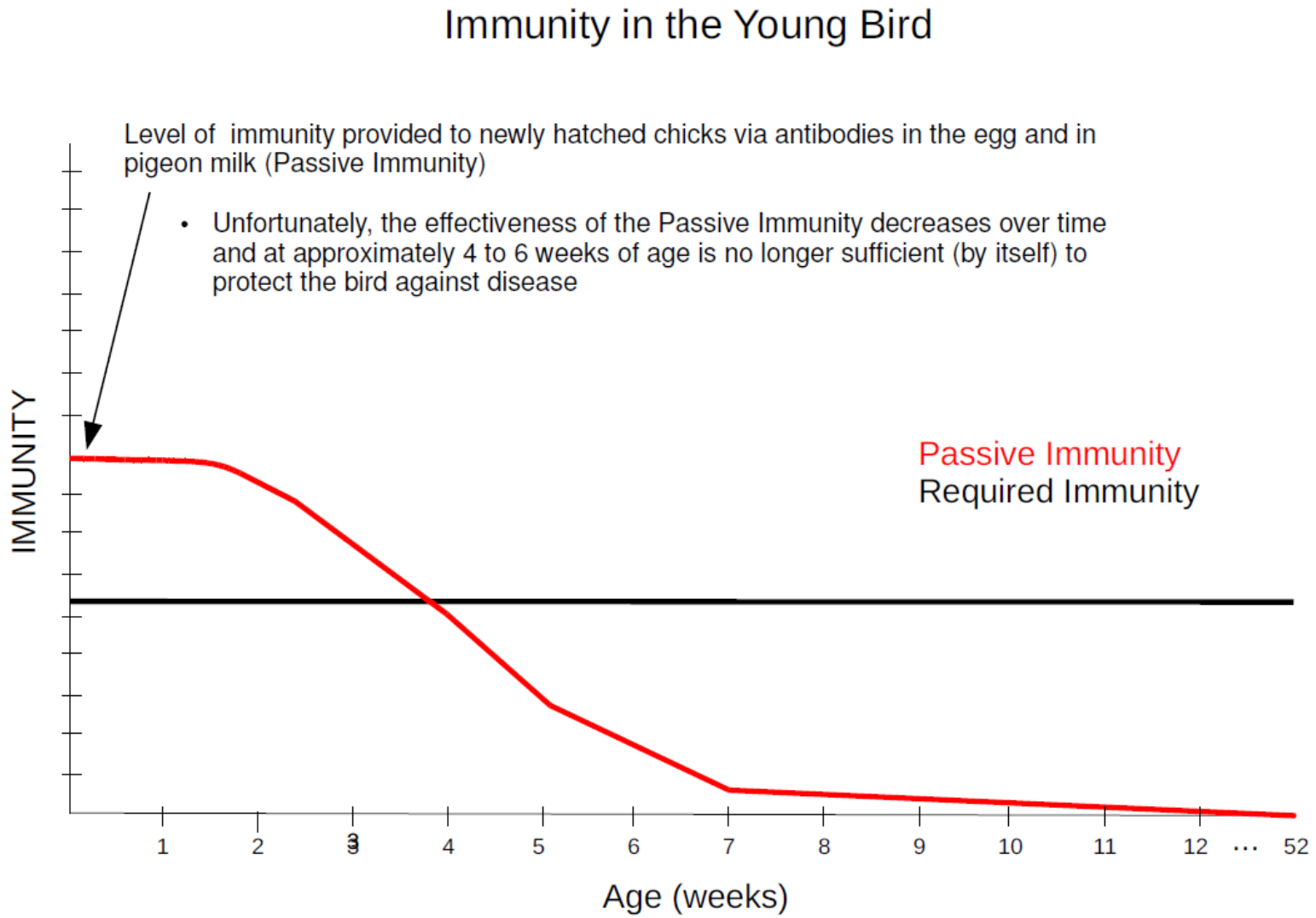

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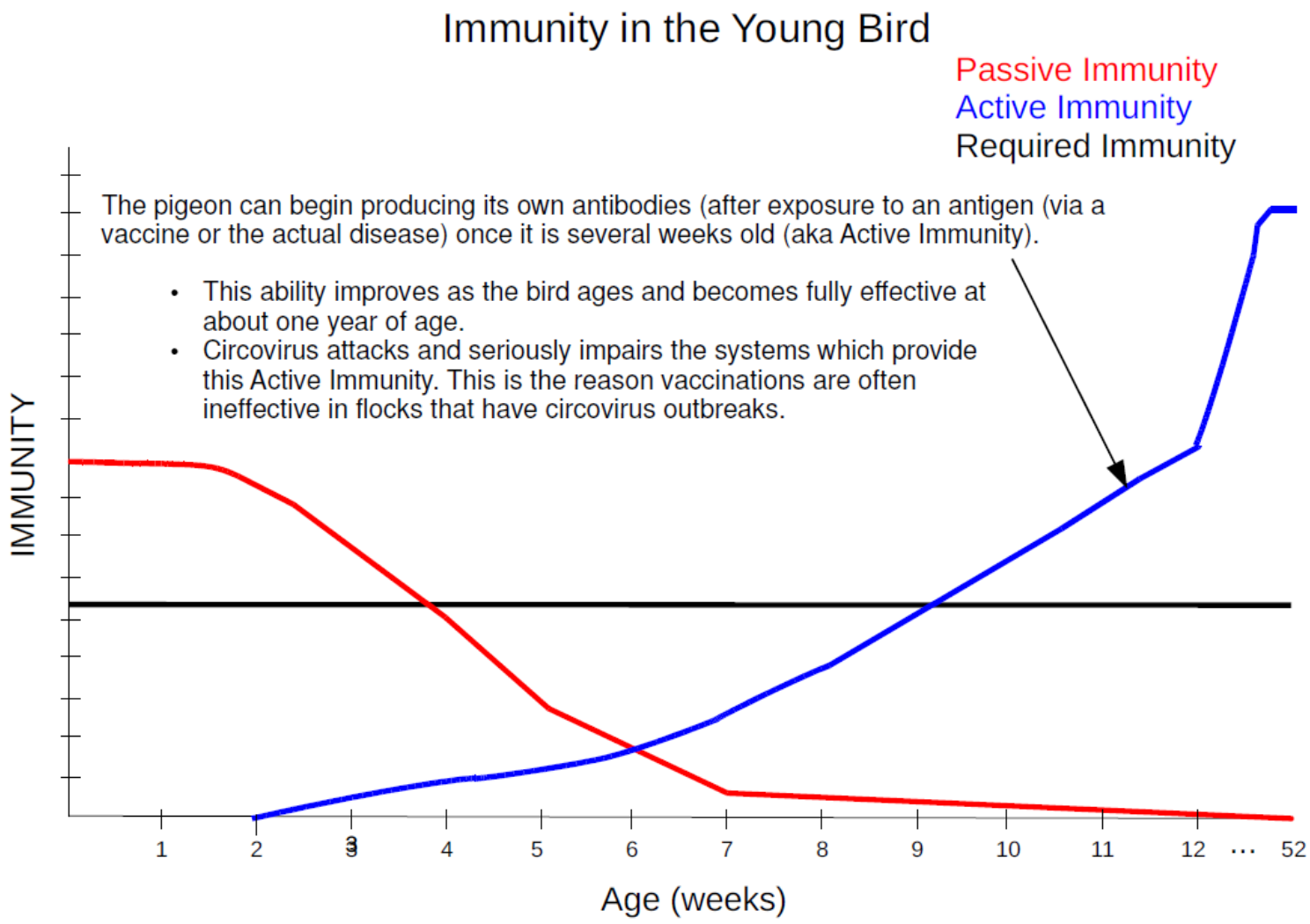

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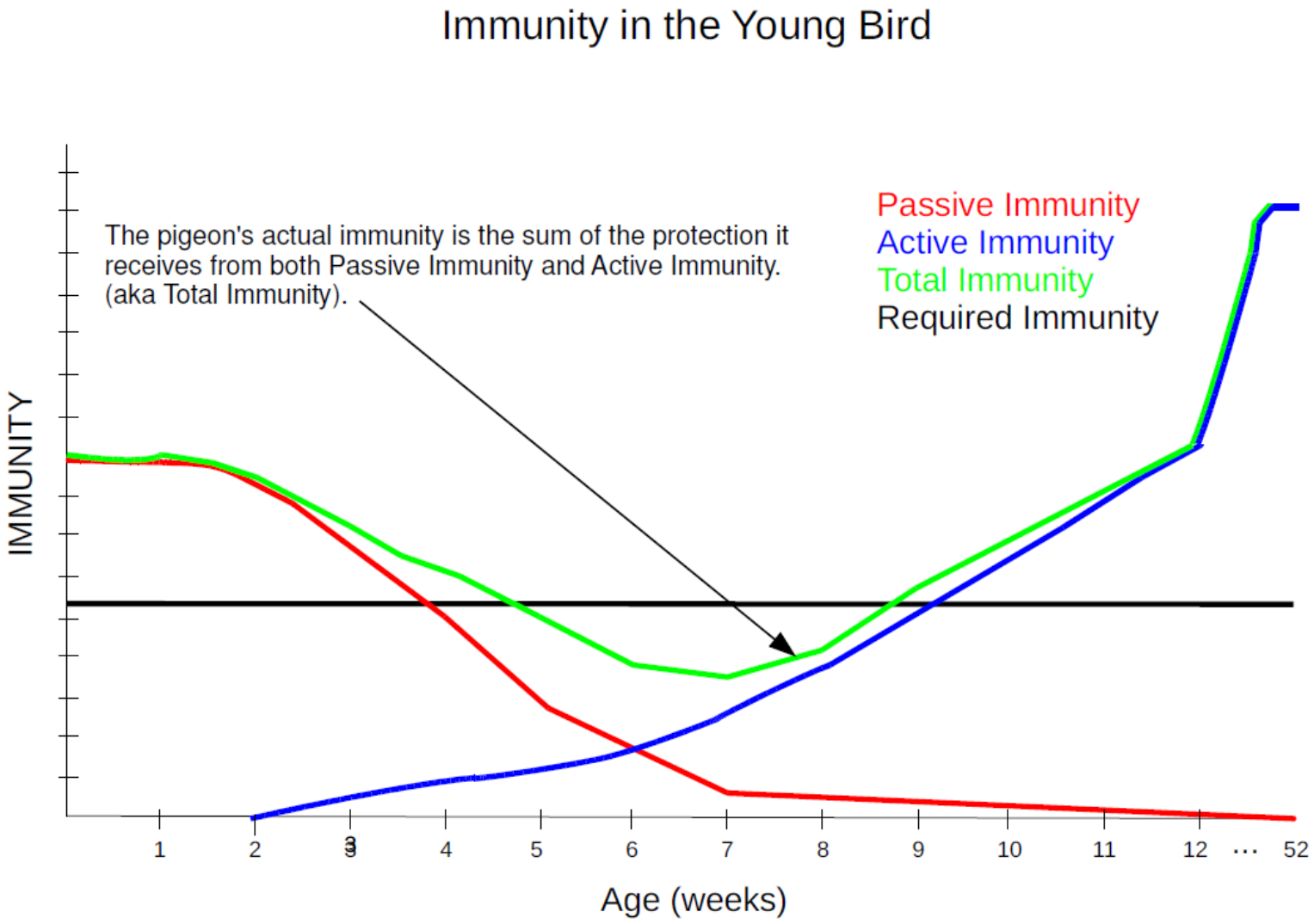

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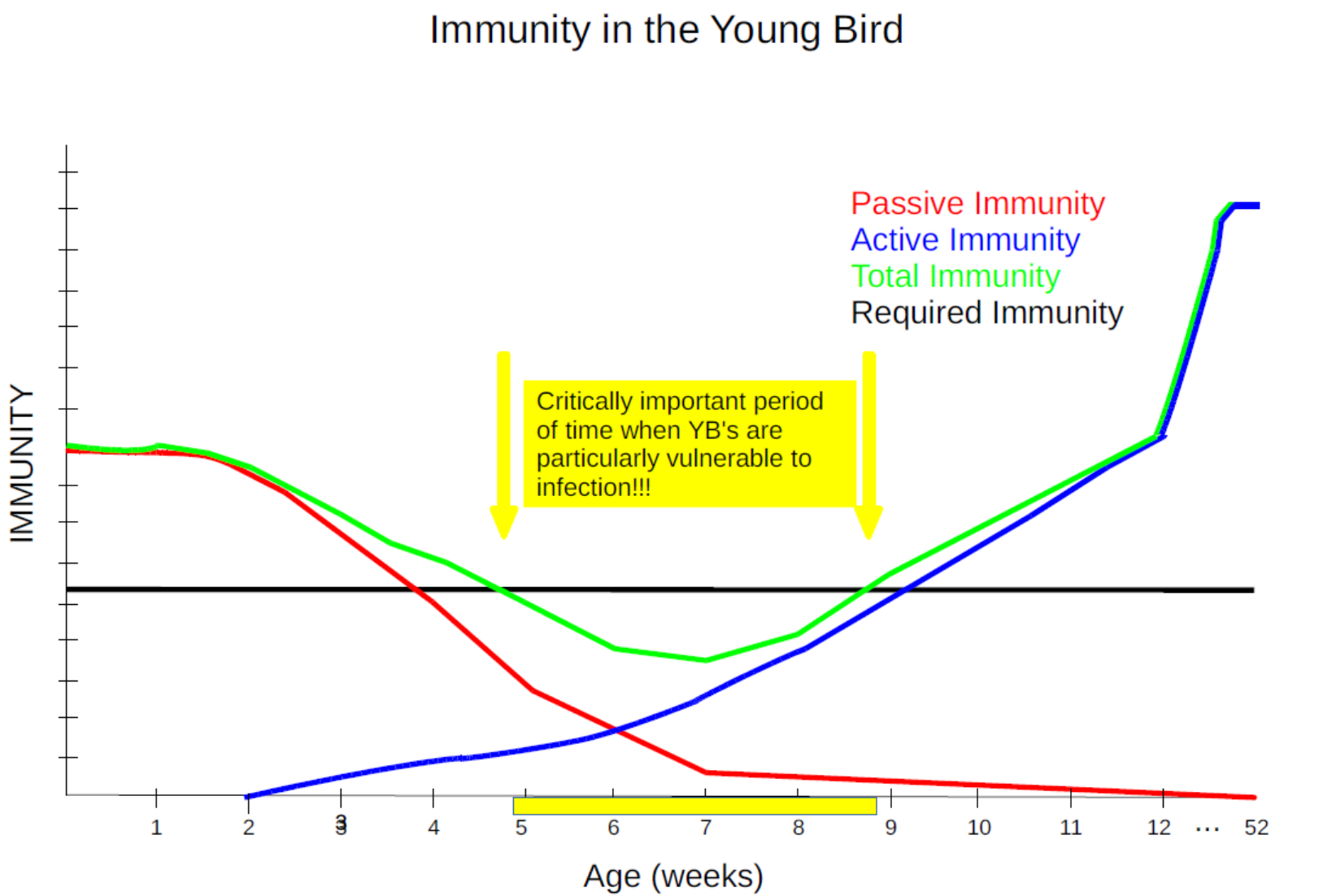


Immunity in the Young Bird

- Think about all the stress we impose on our 5 week old youngsters during what is probably the most vulnerable period of their life.
- Let's consider for example, what often happens to youngsters that get shipped to a One Loft Race. They are:
  - weaned, then
  - vaccinated (PMV and Paratyphoid), then
  - shipped in a box with no food or water and lots of strange noises for 48 hours, then
  - put in a new unfamiliar pen, with
  - birds from many different lofts carrying many different and new pathogens, and
  - subject to a new social order (with its attendant territoriality) like they have never before experienced.

Immunity in the Young Bird

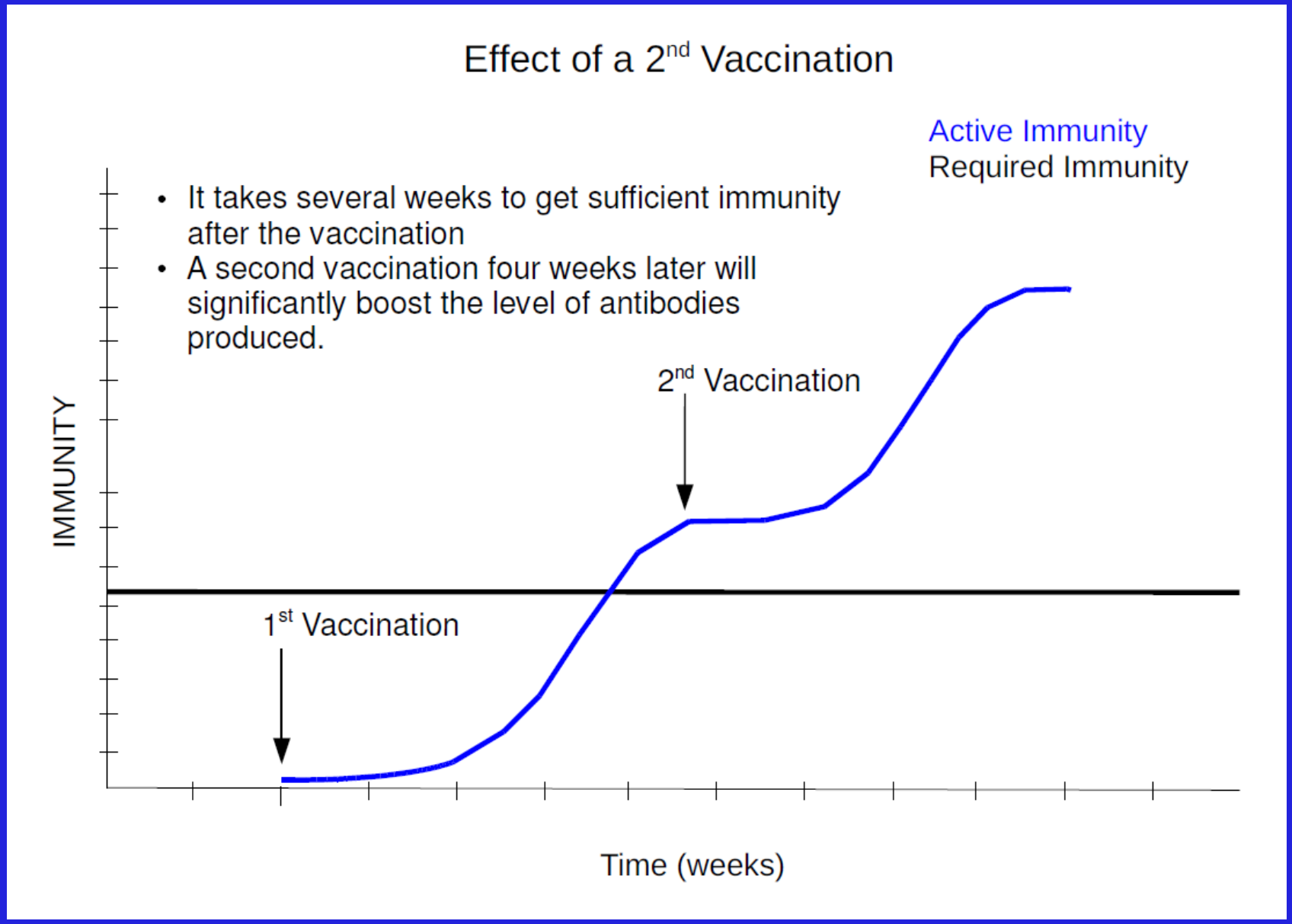
- This enormous stress coupled with the insufficient immunity of the 5 to 9 week old pigeons, sets up a perfect storm for an outbreak of Circovirus which then sets up the group for outbreaks of Adeno, Herpes and Paratyphoid.
- It takes at least two weeks for antibodies to be produced from a vaccination, so the vaccinations we provided at shipping are doing little to help at this point.
- It is any wonder that the One Loft Races are experiencing tremendous health issues and losses?

Immunity in the Young Bird

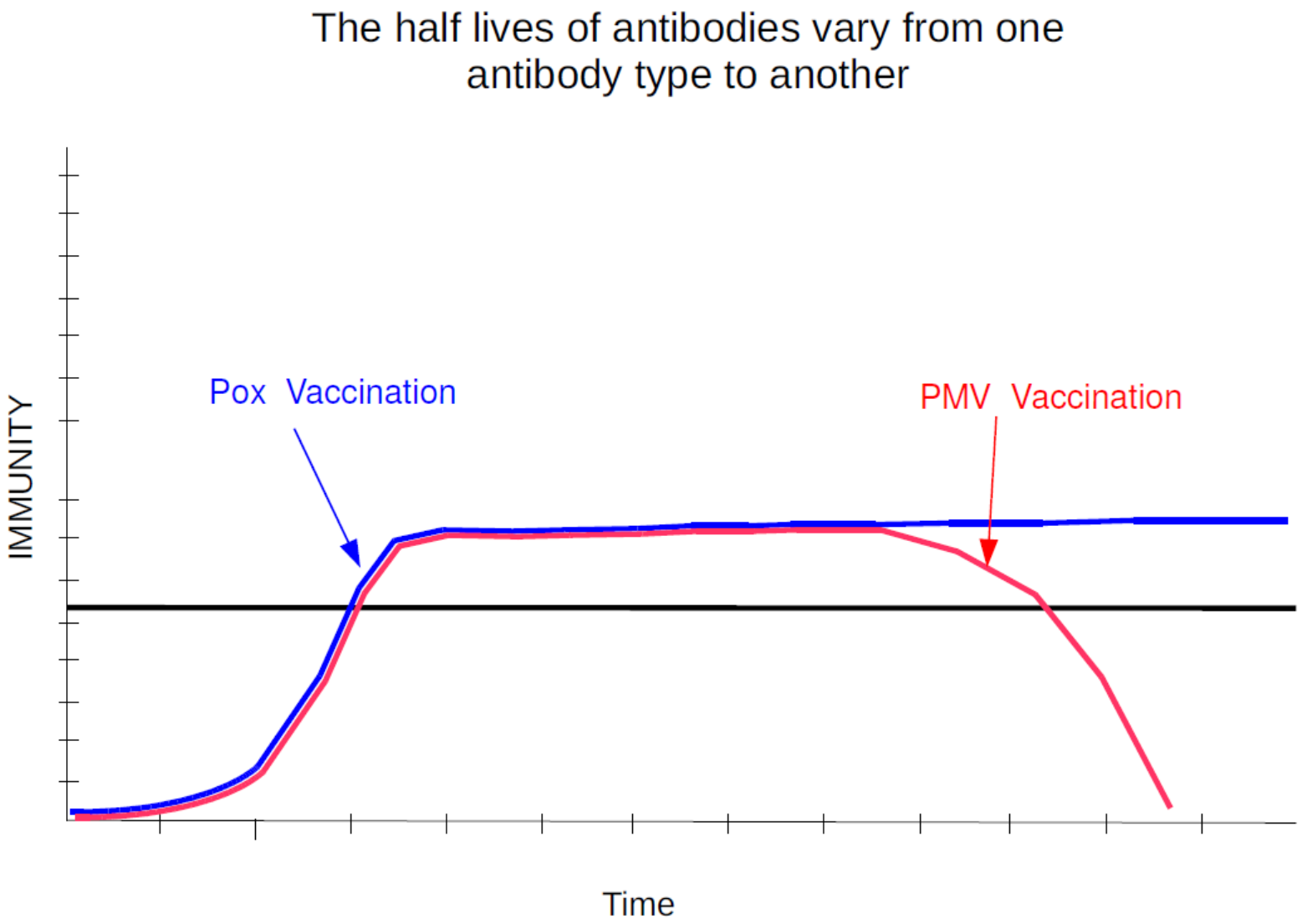
So what should you do to mitigate this situation?

- Make sure your breeders are vaccinated 30 days before breeding for PMV and Paratyphoid. If you can get the Circovirus vaccine do this as well.
- Do everything you can to provide optimum nutrition and minimum stress for the breeders and their youngsters. Use probiotics and acidic water!
- Vaccinate OLR candidates at 3 weeks for at least PMV, Paratyphoid and Circovirus.
- Wean no later than 4 weeks.
- Re-vaccinate OLR candidates at 5 weeks for at least PMV, Paratyphoid and Circovirus. This second vaccination will provide a very significant boost in antibody production.
- Ship in uncrowded boxes at 6 weeks.

Booster Vaccinations Really Help



Different Antibodies Have Different Half Lives



DNA Testing for Performance Genes

The fantastic advances in DNA technology are now available to the sport of pigeon racing!

- DNA Profiling allows us to record the genetic “fingerprint” of a pigeon. This can be very useful later for a variety of verification scenarios.
- Verification of Parentage. While a 100% verification is not possible, the use of at least 16 carefully chosen markers will allow parentage to be verified to a very reasonable degree. www.animalgenetics.com performs this service.
- Sex determination.
- We can now determine the actual genotypes of birds for two genes that have been shown to influence race performance. More are undoubtedly coming.

DNA Testing for Performance Genes

Recent research has shown that the LDHA gene may play a very important role in racing performance of pigeons.

I believe this is a very important topic, but a strong word of caution is in order.

- First and foremost, the LDHA gene is but one of many that contribute to racing ability. Anyone who jumps off the cliff at this point and assumes that LDHA is the secret and exclusive “silver bullet” which will ensure immediate racing success, is almost certainly wrong and will likely end up being very disappointed.
- By the same token, anyone who dismisses these research results as techno babble and irrelevant to real world racing is also very likely wrong and might be missing a significant opportunity to move their gene pool dramatically forward.

DNA Testing for Performance Genes

What is it?

- LDH stands for **Lactate Dehydrogenase**, a group of enzymes that are involved in the conversion of lactate to pyruvate (and vise versa).
- LDH is found in the cells of virtually every living organism (plants, animals and even single cell organisms known as prokaryotes).
- In mammals and birds, there are three different forms of this enzyme that are largely found in specific cell types, reflecting the different functional requirements of those cells. Each type is coded for by a different gene.
- The type **A form** of LDH is found largely in muscle cells and is coded for by the **LDHA gene**

DNA Testing for Performance Genes

What is it?

- When sufficient oxygen is present, muscle cells produce energy from a metabolic process known as aerobic respiration.
- When the exercise is sufficiently intense or prolonged such that there is an **oxygen deficit**, muscle cells use an alternative anaerobic process that **produces lactate (lactic acid)**. Note that pigeons use a metabolic pathway for energy that uses fat and does not produce lactate after the first hour of flight.
- For many years, it was erroneously thought that muscle fatigue during strenuous exercise was due to a build up of lactic acid. We now know that there are several factors that contribute to fatigue, but **how a cell utilizes and/or regulates lactate levels can influence race performance**.

DNA Testing for Performance Genes

What did the research find?

- In 2002, two different alleles were found in pigeons for the LDHA gene, A and B. This means the possible genotypes for LDHA in pigeons are BB, AB and AA.
- In 2006, DNA testing was used to determine the frequencies of the A and the B alleles in four groups of pigeons:
  - The group of fancy pigeons (non racing breeds) had an A allele frequency of **0.6%**.
  - A control group of race pigeons (not screened for racing results) had an A allele frequency of **6.5%**.
  - A group of race pigeons from throughout Poland (specifically screened for “top” racing results) had an A allele frequency of **20.3%**.
  - A group of race pigeons from throughout China and Taiwan (specifically screened for “top” racing results) had an A allele frequency of **21.9%**.

DNA Testing for Performance Genes

What did the research find?

- In 2014, another study was done which again demonstrated a correlation between the frequency of the A allele and race performance.
- This 2014 study also raised the possibility that the influence of the AA genotype may exceed that of the AB genotype in races under 250 miles and that the A allele may be less important in the distance races of more than 311 miles.
- At this point there are many unanswered questions. Much additional research needs to be done.

DNA Testing for Performance Genes

What does this all mean?

- In selecting for race performance, pigeon breeders have indirectly been selecting for the A allele of the LDHA gene (along with others of course that have not yet been identified). This is shown by the ten fold increase in the frequency of the A allele of the racing pigeon control group over that of the fancy pigeons in the 2006 study.
- The three fold increase in the frequency of the A allele of “elite” racing pigeons over the racing pigeon control group further supports the notion that the A allele enhances race performance.

DNA Testing for Performance Genes

What does this all mean?

- Today, the LDHA genotype of any pigeon can be determined by a DNA test. In the US, the test can be performed for $20 with the submission of a single secondary feather. (www.genecheck.com)
- Another good U.S. lab is www.animalgenetics.com and in Europe www.pigen.be is excellent.
- It is now possible for the astute breeder to “fix” the A allele of the LDHA gene in their breeding flock, making its frequency 100%. They are then free to focus on additional improvement through the selection of other key genes, knowing the A allele will always be there in any birds they produce.

DNA Testing for Performance Genes

Don't forget – this is an important gene, but it is not the whole story. There are many outstanding birds (both racers and breeders) who are BB.

- Don't make the mistake of culling birds just because they do not carry the A allele.
- Think instead in terms of adding the A allele to improve existing gene pools and then increasing its frequency.

DNA Testing for Performance Genes

In 2013 I bred an incredible bird. His Contemporary Group Test record was unlike any of the thousands of birds I have tested. No other bird has had a record that was even close. He was an off the chart freak!

- His band was 3079-AU-13-SHEW and I named him “The Freak” (sorry Frank McLaughlin, I didn't know at the time you had one with the same name).
- Later when I started testing my birds for the LDHA gene, I assumed he would probably be at least AB and maybe even AA.
- Well he wasn't. He was just a BB.

DNA Testing for Performance Genes

In 2013 I bred an incredible bird... He was an off the chart freak!

- There is this natural tendency when doing gene testing to be disappointed when the results come back without the hoped for (or expected) alleles. Don't let this happen!
- There are probably a hundred (or more) genes that contribute to a pigeon's ability to race. The LDHA gene is important, but it is still just one of at least one hundred.
- If you have an outstanding family of birds and they test out as almost all BB, this is actually a very good thing. It means you have the right alleles for many of the other 99 genes. If you add the A allele for LDHA, it will be like throwing gasoline on a fire – BOOM!!!

DNA Testing for Performance Genes

In 2013 I bred an incredible bird... He was an off the chart freak!

- Earlier this year I started to do some DNA testing for another gene scientists have correlated with race performance in pigeons.
- It is the Dopamine Receptor D4 gene and is commonly called the DRD4 gene.
- It turns out “The Freak” tested CTCT for DRD4 which we will see in a few minutes is super.

DNA Testing for Performance Genes

- The DRD4 gene codes for the D4 dopamine receptor, which is a protein-coupled receptor found on the surfaces of certain cells of the central nervous system. These receptors are activated by dopamine and are part of an elaborate messaging system within the body used to regulate various neurological processes. **DRD4** stands for **D**opamine **R**eceptor **D4**.
- DRD4 has been studied in humans and various mutations of the gene have been linked to a number of neurological and psychiatric conditions such as schizophrenia, certain eating disorders, Parkinson's Disease and even some addictive behaviors.
- Some have tied certain variants of the DRD4 gene to curiosity, restlessness and the urge to explore.

DNA Testing for Performance Genes

- In 2015, Proskura *et al* published a paper in the journal *Animal Genetics* which studied the association between nucleotide variations at various locations in the DRD4 gene and racing pigeon performance.
- At two of these locations, differences in nucleotide sequences were found to be correlated with race performance for race distances of less than 400 km (249 miles).
- The precise mechanism by which the DRD4 gene influences pigeon racing performance is not understood at this time. Given the wide range of effects found in humans for mutations of this gene, this will most likely not be an easy question to answer.

DNA Testing for Performance Genes

- Whatever the mechanism, the results of this paper show a correlation and we can use this to our advantage as animal breeders. As was the case with LDHA, additional research is clearly needed.
- The 2015 paper studied race performance for the nine possible genotypes they identified for the DRD4 gene in pigeons:

  CCCC, CCCT, CCTT, CTCC, CTCT, CTTT, TTCC, TTCT, TTTT
- Not all nine genotypes were found in the test population. Of those that were found, there was a statistically significant difference between the race points earned by the **CTCT** birds (68.95) verses the CCCC (29.08), CCCT (35.24), CTCC (30.63) and TTCC (29.24) birds.
- It is possible the TTTT, CTTT, TTCT and/or CCTT genotypes are also beneficial, but they are rare enough that none were found in the test group.

DNA Testing for Performance Genes

Lets see how we might apply this -

1) So who do you think I bred “The Freak” to?
    - I poly bred him to:
        - A hen who was AA for LDHA
        - Several sisters, daughters and aunts (his dam was used to produce additional siblings)
2) What would I do with a super performing bird that tested BB for LDHA and CCCC (the lowest performing genotype) for DRD4?
    - Stock it! It obviously has the right alleles for many of the other important genes for which we do not yet have DNA tests available.

DNA Testing for Performance Genes

There are several distinct traits which contribute to a bird who wins races. All of these traits are strongly influenced by the environment, but they also have a significant genetic component. The bird has to have the:

- **ability to orient** itself quickly at the time of release AND maintain the proper orientation on the flight home.
- **ability to fly** at a speed and for a duration that is competitive with the rest of the birds in the race. Many sprint birds, for example, just do not have the tools for competing in a long distance race.
- **desire to want to get home quickly** (as opposed to just plodding along until it gets there).
- **intelligence to resolve challenges** that inevitably arise at some point during at least some races (*i.e.* strong winds or a storm that breaks up the flock and blows them off course).
- **ability to learn** from their experiences and their mistakes.
- **mindset of a leader** as opposed to that of a follower (which is somewhat at odds with their normal gregarious nature).
- **willingness to take risks** such as starting for home before the pack is ready, breaking from a group during the race or crossing a large body of water.

GPS Tracking

- A member of our concourse (Matt Hans) bought the SkyLeader GPS Pigeon Tracking System and he put four of the bands on birds in our first race of the 2017 Old Bird Season.
  - Lovelock, NV to Placerville, CA
  - 164.785 miles
  - The course starts out in the high desert The birds travel west and eventually encounter a large lake (Lake Tahoe) and then a high mountain range (The Sierras).
- Turns out that Matt won the Concourse with a four bird drop and one of the GPS banded birds was part of the winning drop!
  - 638 birds / 39 lofts
  - 1584 ypm
- So, for the first time that I am aware of, we know the actual path flown by an equal 1st race winner!

GPS Tracking

GPS Tracking

- The =1st bird flew an almost straight path.
- When he came to Lake Tahoe, he went directly across the lake and did not veer to the north and follow highway 80 or veer to the south and follow highway 50.
- When he came to the Sierras he did not search out a pass with a lower elevation, but instead went right over the mountains along the most direct path.
- This doesn't tell us how all birds win races, but it does tell us that when motivated to do so, at least some birds will fly a direct path even if that direct path is difficult.
- The data also shows the paths taken by the three other birds who did not win the race.
  - Several different routes were taken with a spread of about 100 miles
  - None of the routes were direct

GPS Tracking

- The tracking system is described in more detail at:

  http://www.sky-leader.com/

- The GPS chip ring is just a little larger than an electronic clocking chip ring and weighs about 4 grams.

- The cost of the system (5 GPS rings, accessories and Fed Ex shipping) will vary a little depending on where you live, but it was $335 for me (I live in Northern California).

Closing Thoughts

- Keep an open mind, but think for yourself.
- Figure out what ***you*** are trying to accomplish and focus on that.
- Remember it is a hobby and it is ***your*** hobby. Do it your way.
- **Enjoy** the sport! Keep it fun for yourself and the rest of us. We all have enough stress at work.