A photograph of two white laying hens standing in a field of green plants. The hens have red combs and are looking towards the camera. The background is filled with various green leaves and stems.

The knowns and unknowns about feather pecking in laying hens

Alexandra Harlander and Nienke van Staaveren

Lyon, August 2023

Our hands do so much for us...

- When I think about the differences between our upper and lower limbs...legs are made for walking.
- Perform gentle and precise actions such as painting a picture or writing a letter
- Perform heavy labor such as digging with a shovel or swinging an ax
- Feel whether something is rough or smooth, hot or cold, sharp or dull
- Hold a child's hand as we cross the street



**Hands- universal element in
different cultures to greet**

The chicken uses its beak as if it were a hand



Food pecking



Positive and negative interactions



Preening



Nest building

The chicken uses its beak as if it were a hand

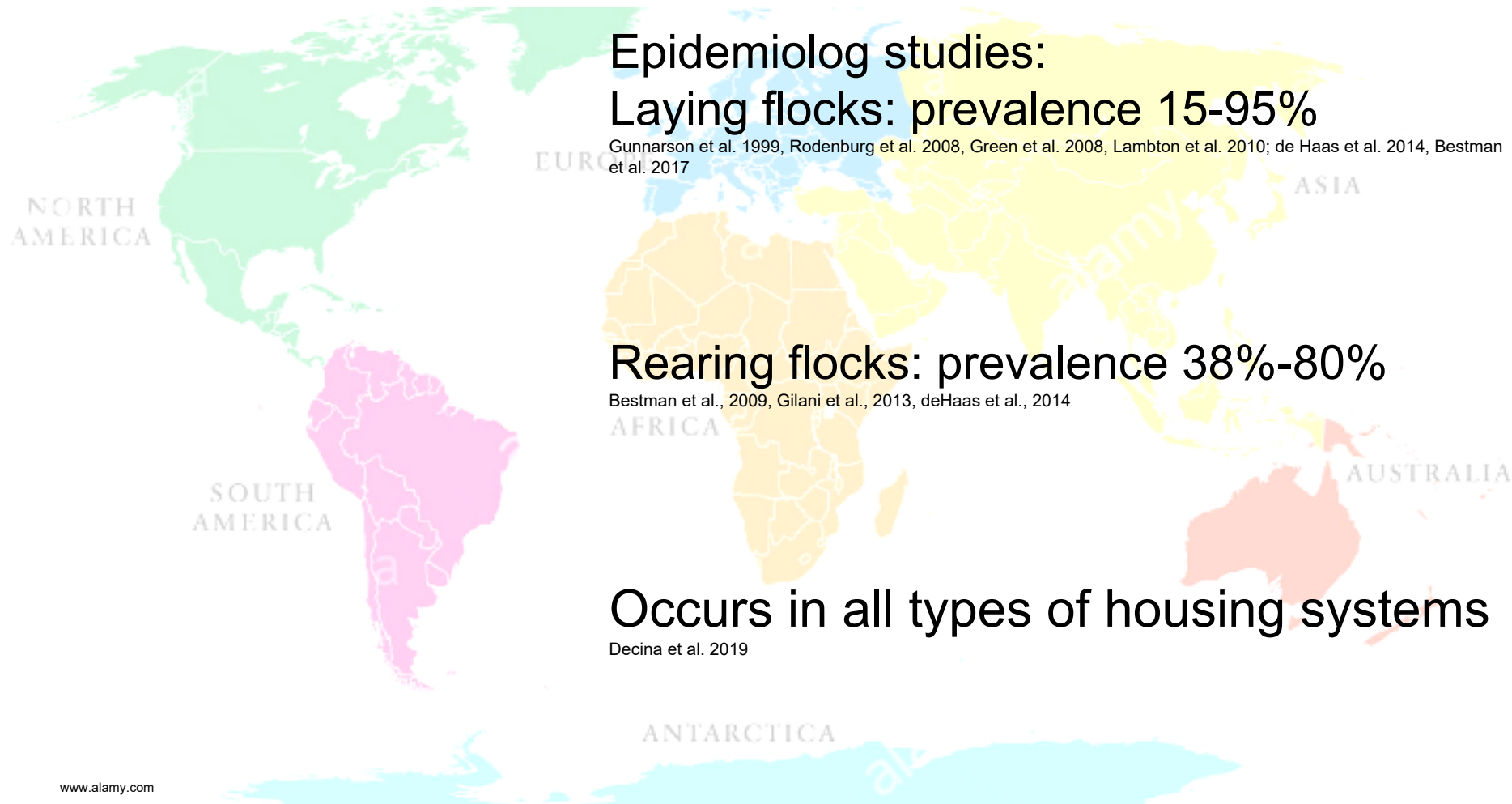
Oral repetitive
bird- to- bird pecking



one hen pecks at
or
plucks the feathers from
another hen

to perform severe feather pecking (FP)

FP - Is it a problem?



Comparison of different studies..

DEPARTMENT OF
**ANIMAL
BIOSCIENCES**



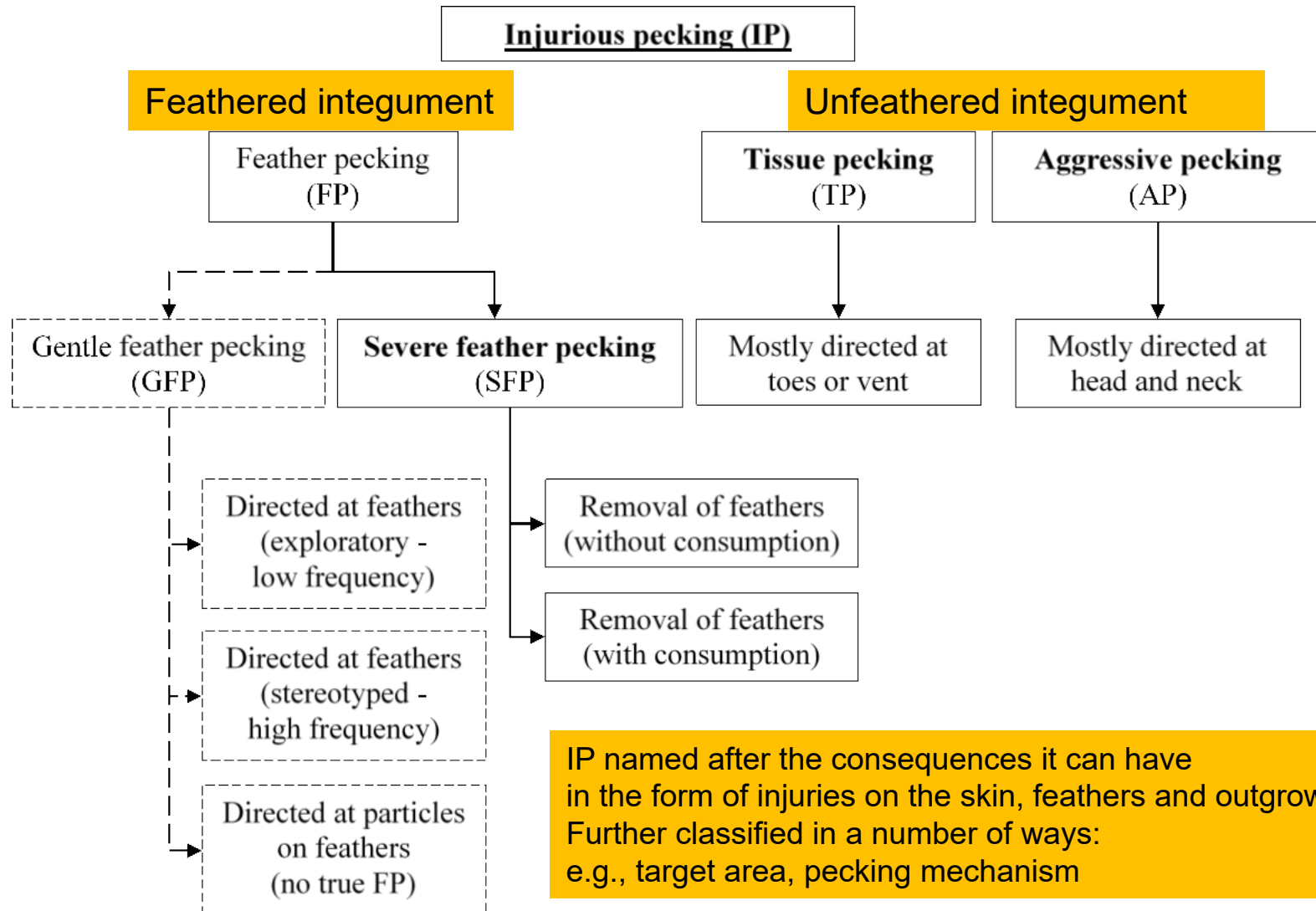
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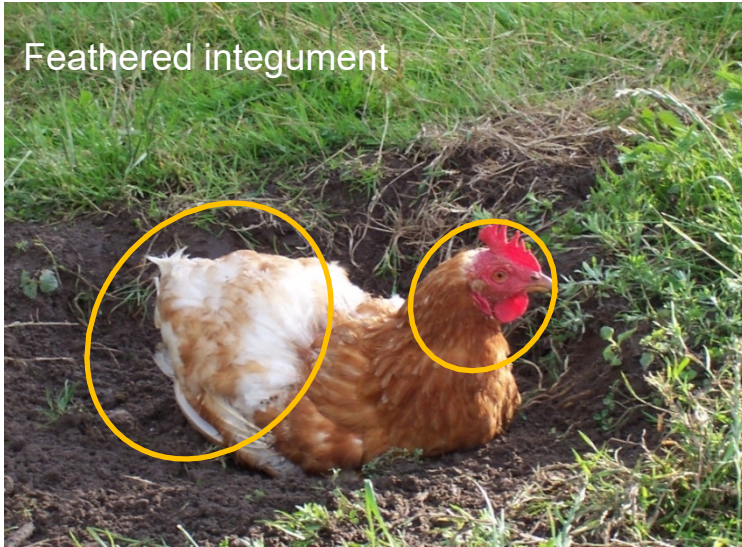
...are often complicated due to different methods and definitions, thresholds used, flock age at the time of recording, strains, and whether or not birds were beak trimmed Nicol et al. 2013

Different categories of behaviour that fall under the umbrella term IP



Relationship between different forms of IP...

Feathered integument



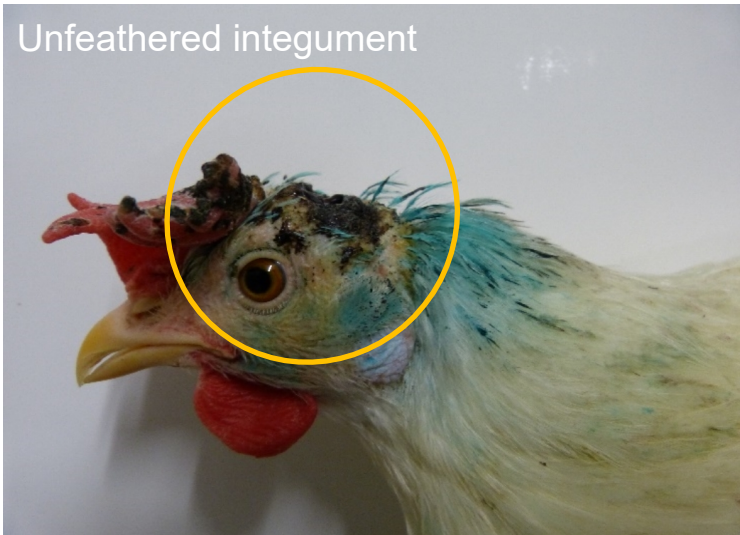
Some evidence **for** a relationship

- Severe FP and tissue pecking (vent/toe)
Hughes and Duncan, 1972; Cloutier et al. 2000; Poetzsch et al. 2001
- Severe FP and aggressive pecking
Bennewitz et al. 2014

Some evidence **against** a relationship

Newberry, 2004; Birkel et al. 2017

Unfeathered integument



These relationships do not reveal the **underlying causation**, but appear to be aggravated by similar contributing factors, though do not necessarily occur within the same flock at the same time

Lambton et al., 2015; Newberry, 2004

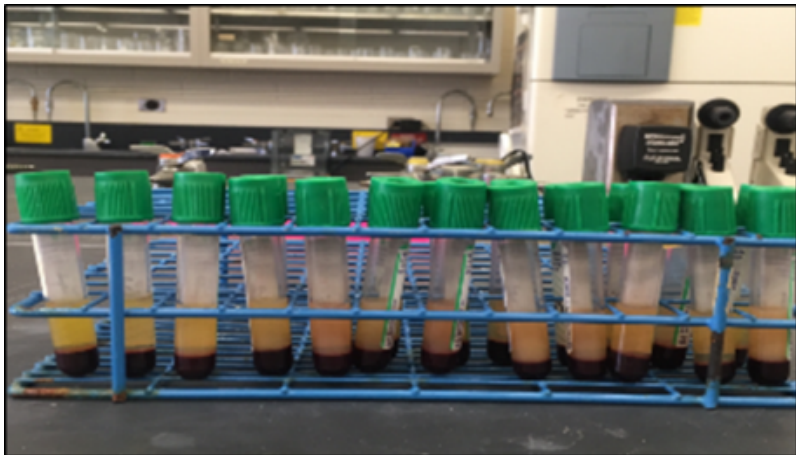
Underlying causes of severe FP



Multifactorial problem with many contributing factors Rodenburg et al. 2004

Approached from two angles:

- The **ethological** view
- The **dysfunctional** view



Both approaches may underlie the development of FP, but their relative importance and interactions are unknown.

Ethological view: Causation of severe FP

Motivation: Frustrated redirected behaviour

food pecking

(Wennrich 1974)



either from ground pecking

(Blokhuys 1986)



dustbathing

(Vestergaard & Lisborg 1993)



Multifactorial process (**genetic**, rearing, nutrition, lighting, etc.)

Occurs in every type of housing system

Consequences can be worse in non-cage systems where outbreaks
can spread more easily

Ethological view: Unfulfilled motivation to explore



- Unavailability of suitable floor substrate increases the risk of FP - emphasizes frustration and the exploration component

Blokhuys, 1989; Rodenburg et al. 2004



- Misperceive feathers as foraging substrate, so peck at and pluck feathers

Riber, 2007

- Feather eating in FP birds

McKeegan & Savory, 2001

Ethological view: Unfulfilled motivation to consume feed – specific appetite



- Highly motivated to ingest feathers

McKeegan and Savory 1999, 2001

- Work hard to obtain access to feather rewards

Harlander & Baes et al. 2006

- Chopped feathers in the diet can improve the feather cover of birds

Kriegseis et al. 2012

- Ingested feathers increase feed passage time/gastrointestinal motility, crop/gizzard distension

Harlander et al. 2006; Benda 2008

- Ingested feathers alter gut microbiota composition

Meyer et al 2012

Ethological view: Challenges and limitations



- Explorative **searching** and **consummatory** phase
- The extend to which these phases contribute, separately or combined, is still unclear.
- Finally, whether a higher contribution from one phase versus the other phase gives rise to different forms of FP different management strategies requires further investigation



Ethological view: Challenges and limitations



Motivation(s) may not explain necessarily

- FP occurs in birds with access to pasture/complex environments
- how FP is modified into repetitive behaviour which increases in frequency and duration over time
- why FP fluctuates over time
- why FP varies among individuals in similar environments
- why FP cannot be completely halted

Can not explain why severe FP is so persistent, repetitive-like, and involves damaging the feather cover of another bird, resulting in physical harm and distress to others.

Dysfunctional view: When is behaviour considered dysfunctional?



....defined as a disruption of internal psychological, biological, or developmental processes, in such a way that their function deviates from that of healthy individuals

APA, 2013

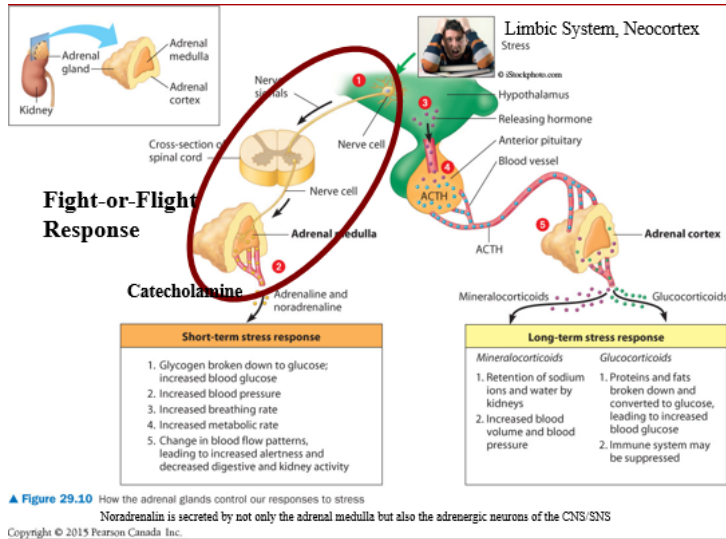
causing the affected individuals to become disturbing or distressing to others or themselves

Wakefield 1992

Inadvertently constructs an artificial boundary between what is considered

- normal/abnormal
- functional/dysfunctional

Dysfunctional view: general concept



Neuroendocrine circuits:

- Autonomic system
- Hypothalamic-pituitary-adrenal (HPA) axis
- Monoaminergic system
- Inflammatory markers

Kim et al. 2013; Sandi and Haller, 2015, Langen et al. 2017

Social and physical adversities throughout the life span have the potential to permanently alter the neurobiology of an animal, which can lead to dysfunctional behaviour.

McEwen, 2012; Lewis et al. 2007

Impact is highly dependent on **adversity, duration and developmental windows** in which such stressors are experienced, as well as the genetic and epigenetic landscape

Kim et al. 2013; Sandi and Haller, 2015

Links between neurobiological alterations and behaviours are associations!

Dysfunctional view: severe FP?



Shares similarities with developmental disorders, such as ADHD, OCD or related disorders, such as trichotillomania or skin-picking?

Van Hierden et al. 2004; Kjaer, 2009; Kops et al. 2014

Prevalence of these
human disorders: 0-10%

Kessler et al. 2005; Polanczyk et al., 2007; Zablotzky et al., 2019

Prevalence of FP: 15-95%

- By-product of breeding?
- Few large breeding companies

Dysfunctional view: severe FP



Neurobiological outcomes are categorized according to the source of adversity linked to severe FP

Theoretically, adverse life experiences/risk factors for severe FP can cause neurobiological changes

- Purposely introduced **adverse social** (social isolation, disruption of social bonds, motherless rearing and **physical** environments (e.g. barren
- **Pharmacological** and **nutritional** modulation (e.g. ATD)
- Use of acute stressors

Dysfunctional view: Challenges and limitations



FP-associated neurobiological findings suggest the involvement of the ANS, HPA, monoaminergic and immune system

Nevertheless, inconsistent when describing the degree to which its pathway contributes to FP

- Involved in a broad range of biological functions; molecules could reflect additive and interactive effects
- Small number of studies
- Unintended combination of chronic and acute stressors
- Various genetic lines, ages
- Most of these studies are not conducted on commercial farms (eliminating environmental factors)
- Knowledge gaps - avian physiology

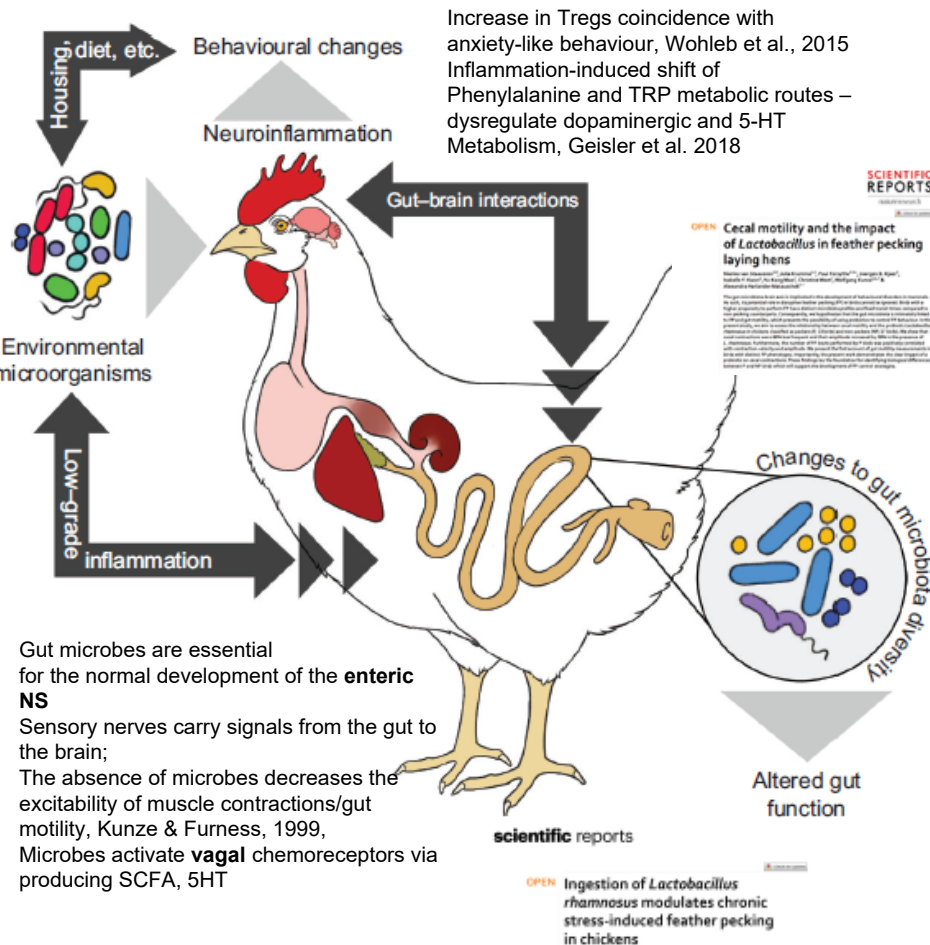
Dysfunctional view: Challenges and limitations



- Are neurobiological differences sufficient to interpret FP as dysfunctional?
- Inconsistent peckers?
- Neurobiological markers do not provide insight into the molecular mechanisms that induce the final FP

The field of research to better understand FP through a biochemical or neuroscientific lense is rich with opportunities.

Future trends in research – new avenues



Understanding the interplay between genetic and environmental factors (will also identify new ways of prevention and treatment)

Integrating both the ethological and dysfunctional approach to understand mechanisms of FP

Exploring non-pharmacological methods to prevent/reduce FP

Thank you for your attention!

