

Elucidation of the Pathogenesis of Animal Amyloidosis

Tomoaki Murakami (Tokyo University of Agriculture and Technology, Faculty of Agriculture)

mrkmt@cc.tuat.ac.jp

Abstract

With a foundation in veterinary pathology, we have conducted pathological analyses of amyloidosis across a wide range of animal species. We have identified the potential presence of AA amyloidosis in cattle and chickens, and, in particular, we clarified that vaccine administration during the rearing phase is involved in triggering amyloidosis in laying hens. To evaluate the risks associated with the consumption of meat containing amyloid deposits, we developed animal models of AA amyloidosis using mice, rabbits, chickens, and quail, and we have conducted research on the transmissibility of the disease using these models. In mice and rabbits, we developed an interspecies transmission model by inoculating bovine-derived amyloid, thereby elucidating the mechanism of oral absorption through lymphatic tissue. We also demonstrated the transmissibility of amyloidosis in birds, proving that AA amyloidosis propagates orally in a dose-dependent manner and that transmission can occur between species, such as between quail and chickens.

AA amyloidosis was considered the most common type of amyloidosis in animals, while other forms were rare. By 2020, there had been reports of 36 types of amyloidosis in humans, whereas only 10 types had been reported in animals. Comparative pathological approaches using animal models are effective for understanding amyloidogenesis; however, there has been a lack of naturally occurring models beneficial for studying disease mechanisms. For this reason, in recent years, we have focused on exploring novel forms of animal amyloidosis and elucidating their pathology. We established mass spectrometry as a new analytical method for animal amyloids, and with this method, we newly identified and reported 10 types of amyloid precursor proteins (LBP, EFEMP1, Keratin5, α -S1-casein, ApoA-IV, Fibrinogen α -chain, ameloblastin, ApoC-III, CRSP1, ApoE) that could not be identified by conventional methods. Half of the currently known animal amyloidosis types have been identified by our team. Grounded in veterinary pathology, we have pioneered research from new perspectives, such as proteomics, and demonstrated that animal amyloidosis, traditionally considered a classic disease, is actually a diverse group of conditions with molecular and pathological complexity. We have been elucidating the numerous pathological consequences caused by amyloid accumulation.

References

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