Dog’s Domestication is based on coevolution with humans
The evolutionary continuity of brain enabled both to social contact and empathy.

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1. Genetic selection is a necessary prediction but not a sufficient explanation for domestication from the wolf to the dog.

2. Domestication is essentially an epigenetic based process of modulation of CNS neurotransmitter activities (Stress-Axis).

3. Furthermore dogs dispose of new qualities:
   - increased learning ability and basic Theory of Mind (ToM) regarding to human behavior
   - dogs has become true mutual bonding partners to humans and have been integrated in human social behavior structures

Coevolution and (neuro)biological conditions

In palaeolithic period humans and wolves were living in similar structured family associations as cooperating hunters. Therefore they developed similar social and hunting behavior and well-defined gesticulation. Due to evolutionary continuity of mammal brains mirror neuron mechanism enables individuals of wolves and humans to understand the meaning of actions done by the others. Humans and wolves could even understand their intentions and emotions inter-speciesly because both were equipped with same internal representations coding motorically the observed actions and even emotions of the others (Buccino 2004 / Senju 2008).

This mutual empathy reduces stress and helps becoming confident. Behavioral cultures between wolf clans and human clans were formed, individual bonding became normal, genetic isolation and domestication processes began.

Model of the Active Social Domestication

Dog-Domestication means decreased flightdistance and decreased sensory threshold chiefly concerning to humans.

• Hence we have to work on HPA stress axis during domestication processes.

• Additional to mirror neuron mechanism we consider domestication is essentially an epigenetic based process of changing the interactions of HPA stress axis and 5-Hydroxytryptamine (5-HT) system.

Epigenetic modulation of HPA stress axis

Limbic brain regions such as hippocampus, amygdala and septum play a key role in mood control. They are sensitive to glucocorticoids and innervated by serotonergic projections. The HPA-stress axis and the 5-HT system are closely cross-regulated under physiological conditions. Changes in their interactions are of particular relevance when regarding domestication processes of animals. The activity of the HPA-stress axis is influenced thrue an enhancement of the corpus amygdalae and an inhibition thus the hippocampus. Glucocorticoid receptor (GCR) density in the hippocampus is likely to affect its inhibitory effect on this system. Epigenetic input is known to impact the regulation of GCR expression.

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Epigenetic modulation caused by social behavior

Refering to M.Meaney’s work (1988 - 2013) there is evidence in humans/mammals that parental care can effect endocrine and autonomic response to stress that endures into adulthood. Predictably, adult offspring of rat mothers which showed increased pup licking and grooming (LG) is equipped with significant increased hippocampal glucocorticoid receptor (hGCR) expression enhancing glucocorticoid negative feedback sensitivity and decreasing corticotropin-releasing factor (CRF) levels. Crossfostering the biological offspring of high-LG and low-LG mothers reverses the phenotype, suggesting a direct relationship between variations in maternal care and development of HPA responses to stress. Stress responses in the adult rat are programmed early in life by maternal care and associated with epigenomic marking (DNA methylation) of the hGCR 1,7 promoter. Even for human brains a significant relationship between childhood abuse and epigenomic marking of the hGCR 1,7 promoter has been described.

Factors described include down-regulation of GCR expression by enhanced methylation of GRexon1; promotorbloc as a consequence of decreased social affection and increased methionine ingestion as well. Social factors like licking and grooming enhance GCR expression via increased serotonin and oxytocin increase, maternal care improves. Hence from generation to generation the stress level of human associated wolves decreased, eventually the wild wolf became a tame wolf.

But a tame wolf is not yet a dog

High cortisol levels hinder neural structures which are important for learning. But tame wolves were used to human presence, hence epigenetic decreased cortisol levels enabled them to learn better to understand humans, ToM concerning human behavior increased. Thus, the tame wolf could grow into a domesticated social dog getting able to work together with humans in an active form of partnership.

Today social interaction between humans and dogs is still reducing the HPA stress axis in both specimens as explained in the model of Active Social Domestication. Reducing stress and invigorate therefore social and learning ability might be the reason of the benefit of dog facilitated therapy in medical and social treatment. Even patients not able to do psychotherapy can profit of dog facilitated therapy.

Dogs are told to be man’s best friends. But why?

Dogs don’t just substitute human partners. Communicating with dogs is mostly a non-verbal emotional based kind of communication. Mainly it is not focused on cognitive forebrain activity, but on limbic and social brain systems decreasing stress activity. The meaning of dog-human bonding is not thinking and planning. The meaning of dog-human bonding is the social relationship itself, to relax and be happy every shared moment. Being relaxed helps staying healthy and enhances learning ability.

Propably described effects already happened in palaeolithic period and supported social and cultural evolution of modern humans.