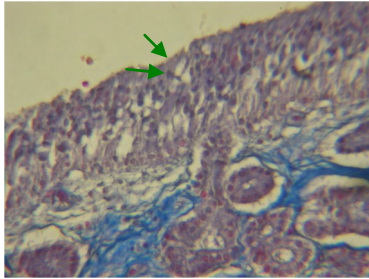


Chemical communication in birds: recent findings.

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People are used to see birds as animals focused on audition and vision. A dramatic contradiction lays in the normal development of the olfactory cavities and bulbs as shown by Bang & Cobb (1968) by studying over 100 different avian species. Since such pioneering research, several authors have described different odorous secretions in birds and moreover their functions during sexual and maternal behaviour as well as in detecting and avoiding predators. Assuming our need of a better understanding of the sensory world of animals for an accurate evaluation of possible behaviour problems, this paper describes the state of the Art in this neglected field.

Thanks to anatomical and physiological research, birds are no longer seen as anosmic animals and the complexity of their olfactory system and capabilities is well described. Scents play a role in food location in kiwis, vultures or petrels (Balthazart & Taziaux 2009) but also in recognition of familiar places like the nest in chicks (Porter et al, 1999), petrels and relatives (Hagelin, 2007). Moreover, chemical signals have been shown to play a major role in predators' detection (Roth et al, 2008), in sex recognition (Bonadonna et al, 2009), in specific partner's recognition (Bonadonna et al, 2007) and in mother-hen to chicks communication (Pageat, 2003).



Olfactory mucous in an Emu (*Dromaius novaehollandiae*). The arrow points the olfactory neurons with ciliated membranes.



Uropygial gland in a laying hen (*Gallus gallus*). A mild pressure on the gland makes it release its oily secretion.

The uropygial gland (preening gland), is a major producer of odorous secretions (Bohnet et al, 1991) but some other glands are also involved. Those secretion do not only play a role as primers but also as releasers of hormonal secretions (Madec, 2008). Maternal uropygial secretions are responsible for attracting the chicks when facing a stressful event (Madec et al, 2008), modulating the corticosterone release and modification of the heterophil to lymphocyte ratio and protecting the growth of the chicks against the detrimental effects of stress.

Since the « pheromone » concept is highly controversial, most authors avoid to use it on describing the odorants in birds. Meanwhile, some authors decided to use it in the description of the uropygial secretions produced during mating period in mallards, geese or auklets and names it « sexual pheromones. The release of such secretions is clearly controlled by sexual steroids. Their effects seem to be combined with some other odorants carrying possible individual information which seem to be crucial in seabirds living in high density colonies. The odorant secretions play also a role in the relationship between species and especially between prey and predator. Some bird like the Uppoo (*Uppupa epops*) release repellent odorants which may protect adults and chicks.



In seabirds colonies chemical recognition is a crucial need.

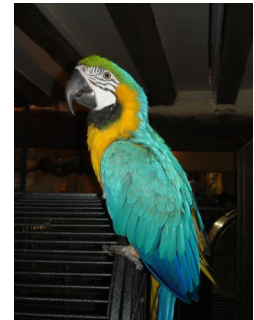


Mating partner and offspring seem to be identified thanks to

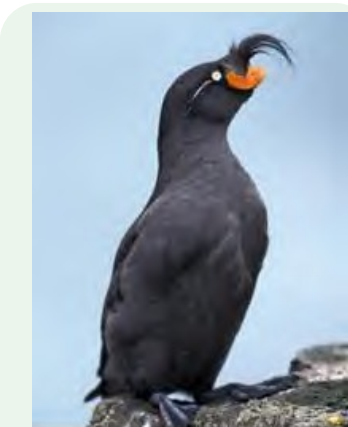
The role of putative maternal secretions has been hypothesized long time ago by several authors. This phenomenon has been studied in species which chicks have early motor capabilities like chickens or quails. In such species, some authors suspected that chicks were guided by the scent of the maternal nest. More recent studies (Madec et al, 2008) have shown that this behaviour was controlled by the detection of a maternal uropygial secretion named Mother Hen Uropygial Secretion (MHUS). Chicks placed in a standardized situation of separation and novelty, tend to choose to stay as close as possible to a source of MHUSA (Mother Hen Uropygial Secretion Analogue, chemically identical to the native secretion).

In livestock species like chickens, produced by artificial insemination, artificial incubation and growing without any relationship with any adult conspecific, the effectiveness of this maternal semiochemical in controlling social stress and aggression makes the role of chemical communication in birds, an evidence. The possible improvement in the quality of life and welfare of such species broad in industrial conditions, is an interesting approach. In presence of the maternal scent, broilers do not only show lower indicators of stress but do have significantly better economical results which make such a strategy acceptable for both ethical and economical reasons. Programs trying to save endangered species face the same problems. In order to optimize the production of chicks from the rare adults we can have, rescue programs use the same technology used for livestock birds.

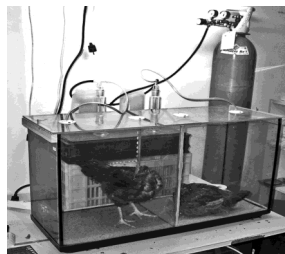
The causes induce the same effects. Birds obtained thanks to such methods appear to be smaller than wild ones (well-known in parrots), the rate of spontaneous death and sensitivity to infections is higher and sociability is poor. A better understanding in the chemical relationships between mother and chicks should help in improving our efficacy in saving endangered species of birds.



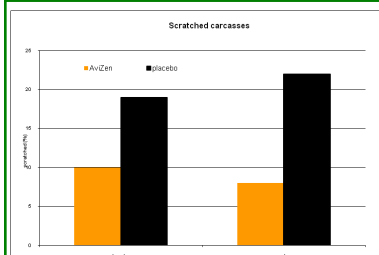
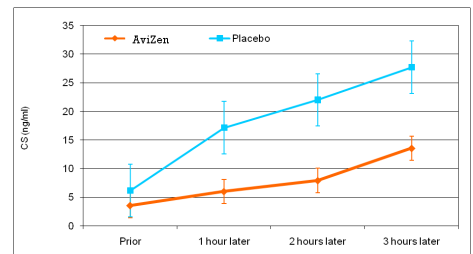
Psittacine birds are some of the most popular pet-birds as well as some of the most endangered species. Hand reared birds are usually smaller, more fragile and less emotionally stable than wild ones.



The crested Auklet (*Aethia cristatella*) releases a tangerine flavoured secretion, through its uropygial gland, during mating periods. Recent studies also demonstrate the role of a two compounds secretion in individual recognition.



Comparative evolution of the corticosterone blood level in chickens facing social isolation, in presence or absence of a synthetic analogue of the maternal odorant MHUS (Mother Hen Uropygial Secretion) (AviZen®).



Heavy broilers, and especially males, being slaughtered later, display more aggressive behaviour leading to injuries which are easily observable after death. Such behaviour does not only lead to immediate physical problems but induces chronic stress. Birds have higher corticosterone blood level and heterophil to lymphocyte ratio, they rest less, are oversensitive to any variation in their surrounding. Other significant impairment in their metabolism lead to a higher rate of fat tissue and a lower growth. Obviously, such impairment has economical consequences which lead breeders and food-industry professionals in paying attention to welfare questions. In this study, two groups of birds, broad in parallel in two comparable buildings have been treated with MHUSA or with a placebo. Carcasses were analysed at slaughterhouse and the rate of scratched carcasses (indicator of the severity of the fights) was measured. The MHUSA group shows significantly less scratched birds (Madec et al, 2008)