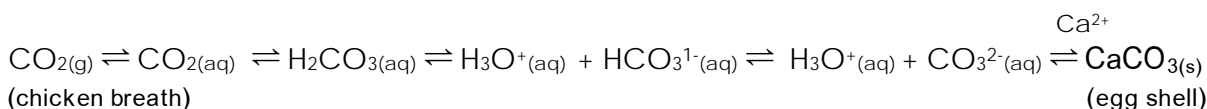


# Chickens lose equilibrium...

## Prefer Perrier water to panting

by David B. Brown and John A. MacKay III

Chickens can not perspire, so when they get hot they pant. This seemingly trivial fact leads to a serious economic loss for egg producers. In hot weather, chickens lay eggs with thin shells that are easily (and frequently) broken. A little reflection shows that this is an inevitable consequence of Le Châtelier's principle and the well-known carbon equilibrium system,



When the chicken pants, the equilibrium is perturbed by the rapid loss of carbon dioxide. Because this effect cascades through all of these equilibria, the effect is a loss of solid calcium carbonate, which ultimately produces weaker egg shells.

Ted Odorn, while a graduate student at the University of Illinois, found the deceptively simple "solution" to this problem – give the chickens carbonated water. Now the equilibrium has been perturbed in the opposite direction. The addition of aqueous carbon dioxide shifts all of the equilibria to the right and results in stronger egg shells. Moreover, the chickens seem to like the carbonated water, and there are rumors that they spend their spare time singing familiar jingles about "spirit" and "the real thing". Philosophical questions about which came first are left to the reader, but in this case, at least, Le Châtelier's principle comes before the egg (shell).