

Last week we laid the ground work about hormones in the body. Hormones are the messengers that tell the organ systems in your body what to do. They work more slowly than other messenger systems and are usually more complex. A major concept that you need to know that relates to all hormones is the way they are regulated. If you get this concept you will be able to understand most of what is going on with most hormones. First you have the two top glands in the body, literally... the hypothalamus and the pituitary glands, both of whom live in the head. The hypothalamus gives the pituitary signals to order the release of all the major hormones from their respective glands including the Thyroid, Adrenals, Ovaries and Testes. (All of these just happen to be the ones we will be discussing over the next few weeks!) In a perfect system the hypothalamus is given orders by a few very complex systems but the main one we will be interested in will be the feedback loop. I'll talk about that in a bit. For now what happens is: the hypothalamus tells the pituitary it needs more hormone and the pituitary yells "we need more hormone". The individual gland is then supposed to produce and release that hormone. The hormone is then released into the bloodstream. This hormone is escorted by a binding protein in the body until it gets to it's target destination, usually a cell or an organ, where the binding protein is separated from the hormone so it can become more active and do the job it is intended to do. This is important: the job can only be done optimally when it is in its "FREE" form or when the hormone is separated from the binding protein. Now, for the feedback loop... when there is enough hormone in the system the hypothalamus senses it and tells the pituitary to give less orders to release hormones to the glands.

This means that there are many places where things can go wrong with your hormones. There can be problems at the hypothalamus and the pituitary giving orders for too much or too little hormones. The problem can be at the individual gland if the gland is not able to produce the hormone that the pituitary is calling for. The problem may be at the binding protein level if there are too many or too few binding proteins to chaperone the hormones. The problem can be at the target organ or cell level where the cell shuts down the doorways for the hormone to enter. The problem may be with the

feedback loop and the hypothalamus doesn't have the proper information to operate on. Lastly, the problem may be with the immune system where your own body attacks the hormone thinking it is an invader. This is called an auto-immune condition.

Now for an example: The hypothalamus senses more thyroid hormone is needed so it tells the pituitary. The pituitary sends out an order for thyroid hormone called Thyroid Stimulating Hormone or TSH to the thyroid gland. The thyroid gland receives the order and releases a bunch of T4 (the less active form) and a small amount of T3 (the more active form). T4 is coupled with (TBG) Thyroid Binding Globulin (a binding protein) and it is sent out into the bloodstream. (Without a binding globulin the hormone would be immediately converted to T3 and used so it would not reach its target). T4 and its chaperone then travel to target cells, mostly in the liver where the T4 is separated from the TBG leaving the T4 in its "FREE" form so it can be converted to the more active T3 so it can do its job. When there is enough T4 in the bloodstream the hypothalamus recognizes this and will then tell the pituitary to slow down or stop the orders for thyroid hormone to be released.

This process happens with all the different hormones our body produces and uses. When it works well then we are doing great but when things start to break down then a lot can go wrong and it can cause problems with the other hormones as they are all interrelated. Next week I'll go into what happens when the Thyroid system breaks down and things to look at to fix it.

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