



HIGH-LIGHT



ALCOHOL AND DRUG NEWS BRIEF FOR EMPLOYERS

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Addiction and nutrition

Part 1 : How the brain produces and maintains it's own drug supply

Let food be your medicine and medicine be your food", the godfather of Western medicine, Hippocrates proclaimed many years ago – not a very fashionable notion in Western medicine today but in Eastern cultures the therapeutic virtues of good food has long been recognized and still practiced to this day. And not without good reason.. But increasingly, Western science is coming to grips with more natural approaches to healing.

In the field of addiction the role of nutrition has been well recognized as an essential in recovery but do patients truly understand **how** nutrition interacts with their cravings and **why** they



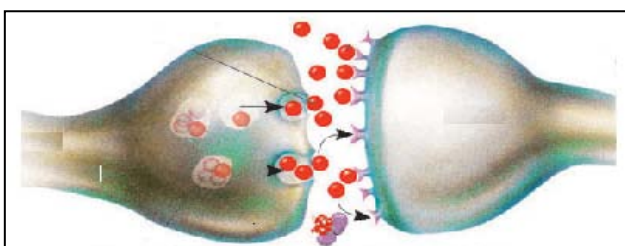
are required to follow specific diets ?. Indeed, it may have been nutritional deficiencies which along with genetic and environmental factors triggered the compulsive behavior in the first place.

Psycho-active substances produce their effects primarily in the brain. Brain cells and the millions of messages which are relayed between them are critically dependant on the availability of naturally occurring chemicals, called neurotransmitters , in the brain The neurotransmitters themselves and in fact the entire communication system of the brain, in turn, are again dependant on the right nutrition – quite simply, the food that we eat.

In this edition of Highlight we take a closer look at how the body creates and maintains it's own pleasurable sensations using only the food that we eat and how substance abuse interferes with this process.

Drugs, moods and foods – what's the link ?

Psycho-active substances produce their effects primarily in the brain. Brain cells and the millions of messages which are relayed between them are critically dependant on the availability of naturally occurring chemicals, called **neurotransmitters** , in the

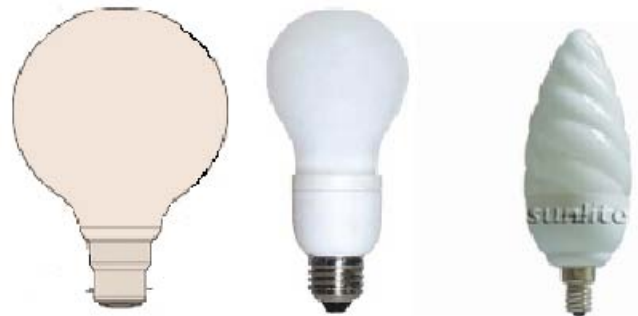


brain. These fulfill the role of chemical messengers between brain cells. By fitting into specific binding sites, called **receptors**, these chemicals pass on the message from one brain cell to the other.

In the figure above, the red balls represent the neurotransmitter. which can be seen to be released from the cell membrane on the left and it fits into its binding site on the opposite side much like a key would fit into a keyhole. Too much or too little of these neurotransmitters in the brain may cause different mood disorders – eg, too little dopamine in the brain is known to cause a loss of drive and enjoyment and cause depression – a loss of dopamine producing cells have also been associated with Parkinson's disease – too much dopamine on the other hand have been linked to schizophrenia.

The mystery of moods – how do neurotransmitters work ?

Each chemical messenger (or neurotransmitter) has



it's own unique "plug in " end which would fit a particular "socket " on the membrane of an adjacent cell. The messengers also differ in their functions : some would **strengthen** the signal as it passes it on while others will **weaken** or inhibit the signal. But although they are all different, they are all vital in keeping our moods on an even keel and would arouse or tranquilize us only when necessary for optimum functioning under certain circumstances, eg sexual excitement, arousal of appetite , pain awareness, etc.

One can compare this process with a light bulb. The bulb on the left has a bayonet fitting and would not fit into a screw-in socket. In fact, each of the bulbs above has it's own type of fitting and these bulbs will clearly not fit into each another's sockets. They also have various functions in the house. Some bulbs are really powerful, for instance, spotlights which need to light up



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the detail on a model whereas low powered lights are much more effective in creating a certain ambience. In their unique but effective ways they all contribute towards our quality of living. Imagine walking around in a shopping mall lit up by nothing more than the yellow glow of 60 watt bulbs !

Thus our moods, emotional and physical drives are not simply responses to the environment. They are largely dependant on a **steady supply** of these chemicals, **enough sensitive receptors** and **smooth conduction of electrical signals** in the brain to keep the organism in a state of homeostasis or "normality" Whether it is hunger or thirst, aggression, sex drive, stress, depression, anxiety or physical or emotional pain, the brain is programmed to secure the survival of the organism without any external interference, relying mostly on it's own painkillers, sedatives, mood stabilizers and antidepressants. (Of course this may not be the case for those unfortunate to have insufficient supplies of these chemicals as a result of a genetic inheritance.)

The neurotransmitters which are closely linked with mood are :

1 Dopamine/norepinephrine, our natural energizer and mental focuser

Dopamine is the ultimate reward drug of the brain and is associated with feelings of pleasurable arousal, concentration, wakefulness and euphoria. With adequate levels of dopamine a person will feel energized, focused and experience feelings of achievement and contentment in the pursuit of certain life supporting activities (eating, quenching a thirst, sex). Noradrenalin is also classified as a hormone and is released under conditions of "positive stress " (also called eustress) such as exercise, bungee jumping, rollercoaster rides or dancing.

2 GABA (gamma amino butyric acid), our natural sedative

This chemical calms down the central nervous system as it controls the release of the natural pleasure arousing chemical dopamine. Adequate amounts of GABA turns down the excitability in the central nervous system and creates a feeling of tranquility and bliss.

3 Endorphin, our natural painkiller and euphoriant

This chemical is the brain's natural opiate (similar in it's effects than morphine, heroine) drug and plays a crucial role in pain relief, natural euphoria and pleasure. The sleepy, relaxed state which typically follows exhaustive exercise or sex are largely the

result of increased levels of these opiate like substances.

4 Serotonin, our natural mood stabilizer and sleep promoter.

Serotonin is associated with mood control, sleeping and dream patterns and temperature control. It is an essential mood stabilizer and counters feelings of despair and depression.

So what does all of this have to do with the food that we eat ? Simply because the neurotransmitters themselves, the walls of the brain cells, the receptor sites and relay of the messages are all built from and maintained by food. Without proper nutrition the body of the drug addict will continuously crave the urge to reward itself with street-drugs

How do drugs interfere with the natural mood chemicals ?

Drugs produce altered states of consciousness and mood simply because they interfere with this "plugging" in process in a number of ways

A drug may bind to a receptor intended for one of the neurotransmitters : Eg, **Heroin** plugs into the opiate receptors in the brain, mimicking the effects of the neurotransmitter, **endorphin** to produce a feeling of bliss and drowsy euphoria.

A drug may induce the release of excessive amounts of a natural neurotransmitter : Eg, **Methamphetamine** unlocks massive amounts of the neurotransmitter, **dopamine**, flooding the synapses and creating a stimulant high marked by increased wakefulness, hyperactivity and appetite suppression.

A drug may interfere with the reuptake of the natural messenger, causing too much of the messenger to linger in the synapse (the gaps between the neurons) : Eg, the drug, **Ecstasy** prevents the natural messenger **serotonin** from finding it's way back into the storage vesicles for later reuse. The increased levels of serotonin is presumably responsible for the mild stimulant euphoria, conviviality and endearment towards others whilst excessive amounts account for hazardous increases in body temperature.

Certain lifestyle events, genetic factors or nutritional deficits may cause a great deal of fluctuation and interference in the *availability* of these chemicals, the number of *binding sites (receptors)* and the *sensitivity* of these binding sites. As drug use continues, the steady and prolonged "substitution process" causes the brain to rely more heavily on these outside chemicals to maintain a state of normalcy.



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However, it is not only drugs which can cause imbalances in the natural feel-good chemicals : an excess of refined flours and sugars could also create these imbalances. These foods also have a drug like effect, altering the brains' mood chemistry and fooling the person into a false calm, or a temporary energy surge. We can eventually become dependent on these drug-like foods for continued mood lifts.

Evidence of the all important role of nutrition in addiction recovery have been amply documented : Therapists have long noted the phenomenon that alcoholics, who have just completed authoritative inpatient treatment regimes, develop a craving for sugary products in an effort to satisfy the brains need for a short-lived energizer.

The brain fights back !

While we are plying the brain with alcohol, drugs and sugary and refined foods for sedation and stimulation in order to keep up with lifestyle demands, the brain is fighting us all the way.

Continued use of drugs (or for that matter, drug like foods) places severe constraints on all the systems in the body, the brain, the kidneys, circulation, the heart and the liver and it goes against the grain of the **homeostasis** for which the brain is programmed.

The brain therefore relies on emergency measures to rectify this over or under stimulated state of affairs through two adaptive mechanisms :

Upregulation

If the activity of a certain neurotransmitter is continuously blocked, the brain responds by making the receptor site for that neurotransmitter more sensitive and by opening up more receptor sites. This is known as **upregulation or sensitization**.

Downregulation

Conversely, if a drug repeatedly continues to stimulate a receptor, the brain tries to compensate for the exaggerated stimulation by making the receptors less sensitive and by closing down some of the receptors, a process known as **desensitization** , or better known as **tolerance**. Treatment and detoxification coupled with the correct nutrition will in time make the receptors more sensitive and will reopen some of the closed down receptors.

Tolerance reflects the actions of the nervous system to maintain **homeostasis** -a constant degree of cell activity in spite of major changes in receptor stimulation. The nervous system maintains this constant level in an attempt to keep the body in a state of equilibrium, even when foreign chemicals are present.

So what exactly is the link between these 4 key neurotransmitters and the food that we eat ? **Quite simply because the brain cannot produce any of**

these chemicals or ensure that the communication goes smoothly without certain basic nutrients.

More specifically the brain needs sufficient amino-acids (which it finds in protein) fatty acids, fuel (carbohydrates) and vitamins and minerals.

Protein – supplying the bricks – amino-acids

The four key mood chemicals are made of amino acids. Of the approximately 23 types of amino-acids, one actually only need to get sufficient amounts of 8 of these (the so-called essential amino-acids) because the body can manufacture the



rest itself. High-protein foods, such as fish, eggs, chicken and beef, contain all twenty-two, including the 8 amino acids that are considered essential for humans. Other foods, such as grains and beans, have some but not all of the essential aminos, so they need to be carefully combined to provide a complete protein (for example, rice and beans, or corn and nuts).

Carbohydrates – fuel for the brain – glucose

While protein provide the building blocks for the mood chemicals and their receptors, the brain in particular, needs fuel which it gets in the

form of glucose when carbohydrates are broken down. The best energy supply to the brain does not come from sudden bursts of quick release energy as may be found in sugary foods high in sucrose but rather from glucose which are slowly released in the blood.

Slow release carbohydrates (foods with a low Glycaemic Index) include almost all vegetables, fruits such as grapefruit, cherries, pears and apples, wholegrain bread and spaghetti and noodles. Almost all vegetables provides carbohydrates which are slowly released.



Fats – vital insulation material

The bulk of the brain is made of fat – which is quite understandable considering the fact that all nerve fibres are covered with this vital insulating substance. Without fats, no neurotransmission will be possible and all electrical activity will end up in a massive short-circuit !

With the abundance of fast food outlets around, the average diet has no shortage of fats – unfortunately we



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get the wrong kinds of fats, the so-called saturated fats found in red meat and processed foods. The best quality fats are the Omega -3 and Omega -6 essential fatty acids and the phospho-lipids. These fats are found in abundance in foods such as coldwater fish types (mackerel, tuna, herring, galjoen and salmon) egg yolk and in sesame, flax, pumpkin seeds and oils. These fats are essential to build brain cell membranes, receptors and healthy neurotransmission.



Vitamins and minerals – gluing it all together

The body can have all the nutrients it needs to manufacture the mood drugs, all the fuel it requires to get neurons to fire and the best nerve fibres for transportation. All of this would be to no avail if these nutrients cannot be converted into the actual mood drug itself. The body cannot manufacture it's mood drugs without the assistance of certain Vitamins (particularly Vitamines B6, B12, B5, folic acid) and minerals, (particularly zinc, magnesium, manganese and calsium.) It's critical role is explained in the diagram using Dopamine as an example :

L Phenylalanine



Needs folate, Manganese, Magnesium, Iron, Copper and Zinc

L Tyrosine



Needs folate, Manganese, Magnesium. Iron. Copper

L Dopa



Needs Vit B6 and

Dopamine



Needs Vit C

Noradrenalin



Needs Vit B12, folate and niacin

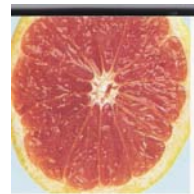
Adrenalin

Summary

The brain is a virtual dispensary of naturally occurring

drugs which interact in a complex manner to help us fulfill our daily tasks and to modulate our moods appropriate to the occasion : It produces and regulates it's own, Prozac, it's own Cannabis, it's own Morphine, it's own Cocaine and Nicotine. But the composition, release and reabsorption of these chemicals are exquisitely tuned to ensure that we perform at our very best and it braces us when life throws it's worst at us.

And its safe. No dealer adds bicarb, quinine or caffeine, you cannot overdose and you won't sell the DVD for a fix of Dopamine. All the brain requires to keep you stocked up is to follow a normal well balanced diet !



Taking drugs is telling the Creator that we will henceforth run our own dispensary and take charge of our feelings – and don't we just have an uncanny knack of making a royal muck up of nature when we do ?

In the next edition of Highlight we will visit the specific ways in which drug abuse interferes with nutrition and the role of nutrition in recovery.

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