Addiction

Physiological aspects on addictions

Narrator
Hand-eye co-ordination, strategic thinking, sense of balance, emotional control. All these things are coordinated in the brain.

Dr Anne Lingford-Hughes, University of Bristol
At the very fundamental basis, I think every thought, or everything that happens in the brain, really does mean that a chemical is released from one cell and recognised by the next cell, whether that's moving your arm or your leg or feeling depressed, or thinking about what to cook for dinner tonight, it's basically it's going to involve a chemical.

Narrator
These chemicals, called neurotransmitters, are working all the time. But if a person takes alcohol or a drug, some cells release more of them. The chemicals are picked up by receptors in neighbouring cells.

Jo
Hello Brian would you like to stand up.

Narrator
Scientists are only just beginning to crack the complex chemistry of the brain. This particular test can't be done on women. So this time Brian has to go it alone.

Anne Lingford-Hughes
We've been looking quite closely at the GABA benzodiazapine receptor system, and this is the brain's natural inhibitory or quietening down system, so when it is active, everything is being calmed down.

Narrator
The system, called GABA for short, may act like a natural tranquilliser, damping down anxiety. It may also allow people to develop a head for their liquor.

Anne Lingford-Hughes
We know that this system changes to protect the body because obviously if you could drink and drink and drink and drink you would eventually become comatose, and potentially die, of course. Well, an alcoholic who drinks regularly a bottle of spirits a day would kill himself. And therefore the body reacts by changing this system.

Brian
I used to like have this thing in my head all the time that if you opened me up, my insides would be black, you know I'm not human like there must be something inside me that's making all my organs work. Because I just didn't think that a body could withstand such punishment for such a long time. But I am human after all.

Narrator
Dr Sue Wilson is interested in the electrical activity in Brian’s brain. Her results will show how well his GABA system is functioning.

Brian
Have they got to be strategically placed?

Dr Sue Wilson
They have yeah.

Narrator
Sue monitors Brian's brainwaves for thirty minutes. Then …

Dr Sue Wilson
We're going to start giving you the drug midazolam which is going to make you a little sleepy OK.

Narrator
The drug hits the same brain system as alcohol does. Now Sue can tune into Brian's GABA receptors.

Dr Sue Wilson
OK Brian this is a kind of summary of that couple of hours that we were recording your brainwaves and each of these lines is a kind of summary of about a minute. Now this is the activity that represents when you're awake and taking notice. And here we give the injection. And this is the area that we're interested in. This is the activity produced by the drug.

Narrator
While Sue's studying how well the GABA receptors are working, Jo and Anne are trying to work out whether there are less of them in certain addicts.

Jo
Ten seconds…

Narrator
Their secret to seeing inside the brain is a very small dose of radioactivity.

Jo
Five, four, three, two, one, now.

Narrator
The radioactive tracer will pass into the brain and latch on to the receptors that Sue has shown in action.

Dr Sue Wilson
There we go, that's it.

Anne Lingford-Hughes
The sliding scale, so yellow is slightly less…

Narrator
The results are a series of horizontal slices of the brain from bottom to top. Red and yellow indicate the highest concentrations of receptors, blue the lowest.

Anne Lingford-Hughes
A lot of this chemical system is in the cortex, which is the outside of the brain. And that's where you see this nice ring in a sense, round the brain. This area is the frontal cortex and we know that this gets affected by alcohol, and so this is this part of the brain, coming through here, slice by slice. The very last part of the brain that often can be affected and we wouldn't be surprised to see a change would be here in the cerebellum, so this area down here.

Brian
The frontal cortex and the cerebellum?

Anne Lingford-Hughes
Yep…

Brian
When you stop drinking, do they rejuvenate themselves, I mean is there any permanent damage to the brain that you know about?

Anne Lingford-Hughes
Inevitably some people will permanently damage their brains but for a lot of people who've stopped drinking who've been dependent or alcoholic, generally what people have shown is that areas like the frontal cortex, which we know as you said can be badly affected by alcohol, do get better with time. And for you, you might see that in better concentration, better ability to think things through, ability to shift between one topic to another.

Brian
My brain's still clearing at the moment I think, but you know I can concentrate and I can think about things a lot clearer than what I've been able to in a long, long time.

Anne Lingford-Hughes
This area here, the cerebellum, you mentioned about being unsteady on your feet, we know that alcohol can affect this organ, um, and essentially almost paralyse it take it out of its proper activity, which is why people stagger and fall over. And it's interesting, not everybody has, seems to have this part of their brain affected but again we know that it can improve.

Narrator
So there can be physical change in the brains of addicts. It's not always clear whether the changes are a cause or an effect of the addiction. But some scientists believe that a vulnerability to alcoholism could be written in the genes.