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Transcript: Day 1, Session 4

AFTERNOON SESSION

DISC: 4

Note: This transcript represents the English language spoken. Spoken Yolngu Matha is indicated by '(YM)...'

RECORDED MINUTES: 0.56.00

REFERENCE: Healthy Breathing Day 1, Disc 4

1st Draft Transcribed by: On Time Typing. info@ontimetying.com

Healthy Breathing and Heart

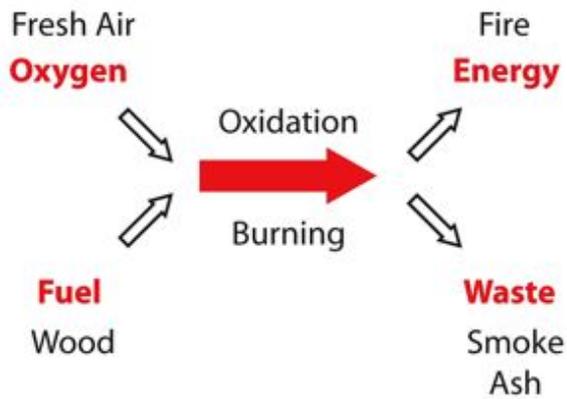


Circulation - Lung PDF Page 13

Powerpoint 2 Slide 2 (Sharing The True Stories: , 2005 : CRC for Aboriginal Health. Used with permission)

Healthy Breathing and Heart

Fire Burning - Energy

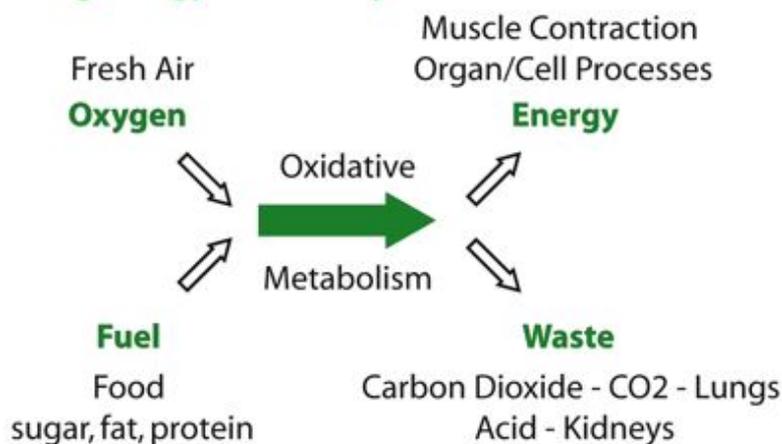


Powerpoint 2 Slide 4 (Attributable to Rob Pierce 2007)

R: ... which is that one there talks about, uses the metaphor of fire for how the cells use oxygen to make energy. Now, we can think of this process which is known in western biochemistry I suppose as oxidation is, oxygen combines with a fuel to make energy and there's some waste. Now, if we use the metaphor of a fire, fire burning to make the energy, the oxygen comes from the fresh air, the fuel is the wood, the grass, and this burning process produces, the fire is energy, that's light and heat is the energy of the fire, and there's waste which is the ashes which is the leftovers or the rubbish, okay.

Healthy Breathing and Heart

Making Energy in the Body



Powerpoint 2 Slide 5 (Attributable to Rob Pierce 2007)

Now, in the cells of the body fresh air provides the oxygen, the fuel comes from the food, this is from sugar and fat and protein that we eat, and the same process produces the energy which is the contraction of the muscles, or the living, and working of the cells in the brain and the kidneys. All our organs function, work and stay alive and do their jobs by using oxygen to keep their cell processes working. And the waste is carbon dioxide, which is another gas if

you like, like oxygen only a different one, a waste one, and how do we get rid of the waste from the body? The carbon dioxide that's made in the tissues comes back from the circulation to the lungs and then we breathe it out into the atmosphere and get rid of it that way. And some of it, our kidneys turn into acid and then it's excreted through the kidneys. So the body has two ways of getting rid of the waste products from this oxidative process which is necessary for all life for these cells to remain alive. So we breath out carbon dioxide and our kidneys get rid of acid. So that's the process by which our cells work, but we have to get oxygen to the cells; so we've got to work out now how the oxygen gets from the air bags where we breathe it in to the cells,

Healthy Breathing and Heart



STTS Breathing p. 6

Powerpoint 2 Slide 6 (Sharing The True Stories: , 2005 : CRC for Aboriginal Health. Used with permission)

and the carbon dioxide that's made in the cells, of all the organs of the body, has to get out of the body. So it has to get from the cells where it's made from the energy process, back to the lungs and then get breathed out into the atmosphere. So they're two very important questions. How does the oxygen get in and how does the carbon dioxide get away from the cells.

Healthy Breathing and Heart

Question :

- **How does O_2 move from air to blood?**
- **How does CO_2 move from blood to air ?**

Answer : Gases *diffuse* from areas of high

to areas of low pressure.

Powerpoint 2 Slide 7

Now, we know that, we've talked about how the breath carries the oxygen out into the lungs and now we're going to talk about how does the oxygen get from the air bags into the blood so it can get carried in the circulation by the pulse out to the cells and the organs.

M: If you've got any questions just ask them. If you don't understand what's going on, stop him and say.

R: Yeah.

Powerpoint 2 Slide 8 (Unable to obtain permission to show illustration)

So this is the diagram we saw before, so here's an air way and these are the air bags. And inside, you can see that these have very thin walls.

Powerpoint 2 Slide 9 (Unable to obtain permission to show illustration)

It's a very thin wall on the air bag. And inside the wall is a blood vessel, a tiny little capillary blood vessel. Now, if we take just that area there and blow it up to the whole screen, so now we're getting very big looking right down very closely with the microscope,

Powerpoint 2 Slide 10 (Unable to obtain permission to show illustration)

this is what we'd see. That wall is here. So this is one airbag with oxygen in it, and this is another air bag, this space here has oxygen in it. And this is the wall, and this is a blood vessel, a capillary, a tiny little vessel that's carrying blood; and this is a red cell, this is a red blood cell; so this is the cell and this is the serum or the clear component of blood. Now, so there's oxygen out here in the air sac. The oxygen molecules move, there are little spaces or cores in these membranes and the oxygen moves through these into the blood and then it goes into the red cells, and the red cells are very strong for carrying oxygen so they carry lots of oxygen, okay.

((Audio Time Disc 4: 1:07:00)

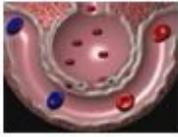
?: That's a good one, good.

R: Good, absolutely. This is necessary for life. That's why if you're anemic and you don't have many red cells as in the iron story, your blood can't carry as much oxygen because the red cells carry the oxygen and that's why you feel weak, because you're not getting enough oxygen to your tissues and your brain. So this is very, very magnified. This distance here is about one millionth of a metre or one thousandth of a centimeter. It's a tiny, tiny, tiny, tiny distance. The oxygen molecules don't have to move very far to get from the alveolae gas in the air bags into the blood. Now, similarly carbon dioxide, the waste product from the organs, is carried in the blood and it has to move back this way into the air space and then can be breathed out, by breathing, that's how we get rid of it. So carbon dioxide waste is carried in the serum and diffuses into the air space and is breathed away from the body and the oxygen is breathed into the air space and gets across here into the blood.

Healthy Breathing and Heart

**Alveolar O₂ diffuses across a/c membrane
and enters the red blood cells (blue to
red)**

- Alveolar – O₂ (movie – widget 08b)



Powerpoint 2 Slide 12

A/Prof Louis Irving, Respiratory Medicine A/Prof Gary Anderson, Pharmacology Department, Royal Melbourne Hospital, University of Melbourne. Permission pending)

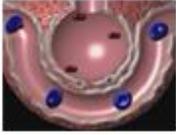
Now, I talked about the process of diffusion; and if you have, I'll see if this works. So, this is the air space and this is the blood. Now, we breathe lots of oxygen into the air space and there's not much oxygen in the blood that comes to the lungs so these ones are oxygen, the two red things, they're moving from the air bag into the blood because there's lots of oxygen there, and not much oxygen there, so there's a pressure to push the oxygen across into the blood. Now, the carbon dioxide is in the blood and that's these molecules here, with two reds and one black, that's the carbon dioxide, is in the blood, there's lots in the blood and not so much in there, so that moves back into the air space to get breathed out. Now, these two things are both happening all together at the same time and it's because there's a different pressure for each on either side of this membrane, the alveolae wall that we were looking at before.

Now, this is an animated way of showing the way oxygen and carbon dioxide move, and if we just look at the oxygen by itself for a minute. Here it is here. So this is the air bag, this is the little capillary blood vessel flowing past, and here are the blood cells coming through. Now, this is that membrane that the oxygen molecules have to diffuse across. Now, if you cut a vein and the blood comes out it's very dark, almost bluish in colour. But if you cut an artery it's bright red. And that's because when the cells have oxygen in them they're red and then when the oxygen gets used up by the tissues it makes the blood blue. That's why people who don't have much oxygen, if you look at the colour of their lips it's blue, it's not pink. Pink is normal, healthy, lots of oxygenated blood. Now, when the blood comes into these capillaries, it hasn't got much oxygen because it was all used up in the body, okay. Then as the cells pass through the capillary, the oxygen molecules coming in here from breathing diffuse across the membrane and see how these blue cells turn red because now they've got oxygen in there; so this is oxygenated blood compared with this coming in has got no oxygen. So this is how the oxygen gets from the air into the blood, and ...

Healthy Breathing and Heart

Blood CO₂ (from body tissues) diffuses across the a/c membrane into alveolar air which is washed out of the airways by breathing

- [Alveolar – CO₂](#) (movie – widget 07)



Powerpoint 2 Slide 13

A/Prof Louis Irving, Respiratory Medicine A/Prof Gary Anderson, Pharmacology Department, Royal Melbourne Hospital, University of Melbourne. Permission pending)

the carbon dioxide goes in the other direction. ... So here are the cells coming in and they're giving off carbon dioxide and that goes the other way back out of the blood into the air space and then it gets taken away by breathing and flushed out of the body. So this process of the oxygen going in and the carbon dioxide going out is the process of gas exchange. So that's how oxygen gets from the air into the blood and how the waste carbon dioxide gets from the blood back into the air.

(Audio Time Disc 4: 1:13:25)

R: Okay, another idea.

M?: Can we not show that one. What about this one.

R: It's not working up here. Okay. So here's our air bag with the oxygen coming in. this is the membrane between the capillary and the air sac, and here's the blood and the red cells going past. Now, this is normal breathing and normal blood flow and it's a very efficient process. All the oxygen molecules come in, diffuse across and go into the blood, they're all taken up and there's none left here so it's a very efficient process. Now, one of the things that happens in disease for example, like in emphysema, is that there's not enough of this alveolae surface area of the air bags. You lose a lot of the air bags that are destroyed in emphysema. Now, this is an interactive video in that in emphysema the air bags are very small or destroyed and not as much oxygen can get through so the total amount of oxygen being taken up by the blood is only half what it was before, because there's not enough air sac for the oxygen to deliver a normal amount of oxygen. Now, another thing that can go wrong with the lungs is that this membrane can get very scarred and thicker and when people have lots of infections in their lungs or get fibrosis and scarring in their lungs this thickens up. Now, you can see these oxygen molecules are getting through fairly quickly to the blood but what happens if you've got a lot of scarring and thickening in that is that it takes a lot longer for the oxygen molecules to get through; so the transfer of oxygen from the air into the blood can be messed up if there's not enough air bags or if there's a lot of scarring and thickening in this membrane. So they are ways in which disease mechanisms interfere with this normal oxygen gas exchange. And this is an interactive animation way of showing how disease processes interfere with gas exchange.

1512

JG What do you think of those?

R: So I've just shown you some interactive animation ways of demonstrating gas exchange and I've introduced the concept of the matching between the ventilation or the breathing and the blood flow. Those two have to be matched

to get a very efficient exchange of oxygen and if they're not matched then the gas transfer doesn't work properly. Do you think that concept of the matching of the breathing and the blood flow is a hard one to understand? Too complicated? Or do you think it's simple enough to be able to get it across.

?: Okay

R: Okay. All right. Now, I think that with these animations and particularly the ones where you can alter the parameters, and change them and do the sorts of things the disease does to the lungs, are very useful ways of; it's hard to convey those messages of the movement of oxygen and carbon dioxide just in still pictures. That's another way of doing it. It's just to use still pictures, I think it may be in these functional things that the animations are particularly useful but that's just my idea and you might not agree with it and I'd be interested to hear what you've got to say about that at the end. Now.

1709

Dhaṅ: ... slower motion I think it might be you know.

R: So you can slow them down and stop them?

Dhaṅ: Yo, just slower motion. And if the Yolṅu is talking like, with a DVD there, behind the Yolngu, explaining

JG: Well how about if you were doing it, you would do it differently,

Dhaṅ We'd have the picture and the speech as well... slow down and explain how, when you see of some kind, if you see that slows up the oxygen, into the um blood cells.

M: Yeah, it has to be a collaborative project.

Dhaṅ: Yo.

M: And a team working and talking about it, finding the Yolngu words for it and finding a good way of representing it and finding ways of talking about it and it's a circular discussion.

Dhaṅ: Yo.

R: Okay.

Bhavini: People find one of the animations easier to understand than the other ones. The ... of showing. Does anyone have a, do you like one one?

Dhaṅ: Just for my idea, the animated ones, these are easier to understand.

Bh: Was there one out of the three that showed that was easier?

R: This one I think is probably, this is probably the simplest of them, because I think the one that tries to show oxygen and carbon dioxide working together is a bit hard to keep up with.

Dhaṅ: Yo and that one's ... that one and this one here, the other one.

R: So this has got the blood cells with no oxygen.

Dhaṅ: Oxygen, the carbon dioxide going this way, too hard. Too hard?

R: Too hard. Yes I think, I agree.

JG: Then again you haven't got the breathing here, so ...

R: Yes we have, this is breathing, this is the oxygen coming in by breathing. Pardon?

JG: But no exhalation, no exhaling.

R: Yeah, okay, you need the carbon dioxide to be taken away by exhalation.

JG: Well, I just think it's all coming in but how would that relate to my breathing. I would just think myself that.

R: Well, they aren't going up and down, they are too small to be going up and down aren't they.

(Laughing).

R: It's a very interesting concept you have raised and the reason for it is, you think of air as the air rushing in and out and in and out, litres in, litres out, or half a litre in each breath, and you think well, that's a very quick sort of process; but the transport of oxygen is not like that. If you think about what's happening here, you've got half a litre going in, in one second, and then coming out again in one second, and then a second's gap because we breathe about once every three seconds. So it's really high flow rates because the cross-sectional area is so small. As that tree branches out the collective cross-sectional area of the very peripheral air ways, once you get down to this, is

huge, so actual gas movement is very slow here, and the oxygen really is just tricking in like this.
2130

MC: So when you go (breathing), all the little red ones start to go down and then you go (breathing).

R: No, no. That's right, no.

MC: Going backwards and forwards all the time.

Dhanj: Yo.

R: Because if you think about it, your trachea's got a cross-sectional area of one or two centimeters, all that air flow is flowing through it; that same bulk air flow is passing through collective peripheral air ways, and the total surface areas of our capillary membrane in the human lungs is the size of a tennis court. That's perhaps a useful analogy. It's the structure and the way all those alveoli, they create a huge area of for this gas, for this oxygen to diffuse across. And that's a feature of the structure of the lungs and there's many, many divisions of the air ways.

2226

(Audio Time Disc 4: 1:23:53)

Bhav: So what we could do is have this ... and ...

R: Yeah, and there's a separate one that's carbon dioxide coming out.

Bhav: But I think John's point is really that we need to have the transitional

R: Yep, like a zoom.

MC: Zooming, yeah, zooming so you see the ... whole body, oxygen at least ... movement of oxygen or air going in and coming out, and then it comes out out.

Bhav: And then that last animation you put on and the other one that we ...

R: Yep, which is.

2323

(Audio Time Disc 4: 1.24.50)

(Some quiet conversation in YM)

R: This one?

?: This one's showing the same thing but ...

R: Yep, okay. So another thing you can do with this one is speed it all up, because in exercise, the blood is going much faster and the breathing is going much faster as well, and again, the matching between the ventilation and the blood flow is important. Now, in a person who's normally at rest the red cells come in here, the cells come in here and they take about three quarters of a second to travel through this capillary; but the transfer of oxygen is so efficient that by a time they are a third of the way through they're completely saturated with oxygen. And when you increase blood flow to a maximum, during maximal exercise, they're just getting completely oxygenated before they leave. So there's a lot known about the dynamics between rest and during maximal exercise, they're just getting completely oxygenated before they leave. So there's a lot known about the dynamics between rest and exercise of the way all this system works. But this one has the advantage that you can talk about what happens when there's disease present, and how that slows down, it takes a long time for the oxygen to diffuse across. So diseases which cause scarring of the lungs interferes with the oxygen exchange, uptake of oxygen.

MC: It would be just says you could do that on the other one couldn't you?

R: You could do, yeah.

JG: When you show it like this, do you think everyone will recognize it.

DhanjYes, ???? My understanding of what of what is given here...2612

R: So that's how the oxygen gets into the blood. Now the blood has to carry the oxygen to the tissues so it can work and help the muscles contract and keep all the organ cell function happening. So now we have to have a way of describing the circulation and I'm going to show you two main ways in which that seems to be done. One is through pictures which is in that book there and I've got some of them here, just talking about how the circulation carries the blood around the body; and it tends to show the heart and the lungs and the blood vessels carrying the blood all over the body and to the kidneys and up to the brain and out into the hands and feet and so forth. Now, through still

pictures, if you're trying to show a dynamic thing you have to have multiple pictures which interrupt it at different stages to be able to tell the whole story so this is how it's done in that book, in the sharing the true stories book. But before that we have to understand the heart. Now, the way the heart pumps is something else that's another concept. How can a muscle cause blood to circulate? So this is a way of trying to explain how the heart chambers can pump blood. So the pink here is muscle and here the muscle is relaxed and here the muscle has contracted, and the blood is coming in to this heart chamber through a vein and there's a valve here. So when the blood is just flowing in, it can push this valve open and fill the chamber and then when the heart muscle squeezes and increases the pressure, that pressure closes the valve so none of the blood goes back up there and it all goes out through the artery. So that's the simple conceptual pump of how the heart works. Now, the heart is more complicated than that in that it's not a single chamber, there are two circulations, two sets of chambers; but each of those is working in this way. So you have valves which provide uni-directional flow when the muscle contracts. That's the mechanism by which the heart works. Now, this is an animation of how the heart works.

JG: How would Yolngu see that?

R: And this shows the heart contracting and when it contracts it rotates a little bit, so the heart is a muscle which has pace-maker tissue, it contracts, relaxes, contracts, relaxes, contracts, relaxes, all by itself, and I'll talk more about how it pumps the blood around the lungs and the body organs in a moment but this is the concept. So in here there are two sets of chambers pumping blood in the way that that model, and I'll come back to this in a minute but I want to explain something else before we do. And that is, how do you explain the circulation of the blood in pictures. And generally in these things the arteries are coloured red because they've got oxygenated blood, full of oxygen, so it's red, and they carry the blood out to the organs and tissues, and the veins come back and they're usually coloured blue because the oxygen has been used up in the tissues and the blood that's coming back is low in oxygen. This is the circulation in the sense that the heart is pumping here and with each pump you can feel the pulse here, and again you can feel it here in the neck, pumped with each contraction of the heart, and we can measure the blood pressure anywhere where the arteries are fairly close to the surface but that's usually in an arm or a leg.

Now, this one. The right side of the heart collects the blood from the veins and that's de-oxygenated blood, it's blue, and pumps it out to the lungs. Now, you have to use multiple pictures which all look the same just to show how the circulation works. So this is de-oxygenated blood being pumped by the right side of the heart out to the lungs, where the oxygen gets added, it gets oxygenated, and then it comes back through the pulmonary veins, now red even though they're veins because they're carrying oxygenated blood, back to the left side of the heart, so this is the red here, is the oxygenated blood coming back from the lungs where it picked up the oxygen; and it comes back to the left side of the heart, not the right side of the heart; and then the left side of the heart pumps this oxygenated blood out through the aorta to all the arteries, up to the brain, down to the kidneys, everywhere else around the body; where the tissues use up the oxygen; and then the veins carry that de-oxygenated blood back to the heart and then it's going to get back to the right heart, and then it's going to get pumped out to the lungs again to get oxygenated again. So it's taken five still pictures with different colours and so forth to demonstrate the fact that there are two circulations. One side of the heart is pumping blood to the lungs and back, the other side of the heart is pumping blood to all the organs and muscles and limbs and tissues in fact. So it's a fairly complicated concept to explain using pictures like this; you have to have multiple versions of the same picture with different phases of the circulation in it. The other thing that's important is that if you consider the hand, these are the arteries carrying the blood out, oxygenated, and there are these blue veins which are carrying the de-oxygenated blood back, but then you've got to have capillaries out here and they're usually just represented by these little wiggly things, where the oxygen diffuses out of the blood into the tissues, and is used by the cells there. So you have these little capillaries joining the arteries to the veins and it's there that the oxygen gets taken out and the carbon dioxide gets put back in by the cell energy producing processes that are happening out here. It's the same with the brain; you've got arteries carrying blood to the brain, capillaries where the oxygen is taken out and used by the tissues, and the carbon dioxide is added back into the blood and then veins that come back down. And this is the systemic circulation as distinct from the pulmonary circulation which carries the blood to the lungs. So the right heart pumps blood through the pulmonary circulation to the lungs to get oxygenated and then the systemic circulation from the left heart pumps blood from the aorta to all the organs where the oxygen gets used up. So the circulation itself is a fairly complex structure to try and get across in terms of a simple explanation, I think. I'd be interested to hear what you think.

Now, here's the animated way of doing the same thing. Let's go back to that one that we were looking at before. Okay, so the blue is the de-oxygenated blood being pumped out to the lungs where it takes on oxygen and comes back in the pulmonary veins as red, so that's the pulmonary circulation and that's all happening in the right chambers, pumping that blood; and then in the left chambers, this is the aorta, here's the oxygenated blood that's come back from the lungs and is now being pumped out to all the organs. This might be the brain or it might be a kidney or it might be a muscle that's working somewhere. Oxygen is used up in that space and the de-oxygenated blue blood comes back through the systemic veins to the right heart and then goes out and gets oxygenated. So you've got this double circulation thing happening the whole time. This is happening at about real time rates at about 60 beats a minute, this heart is pumping away here; but you can stand here and talk about this and talk about the systemic and the pulmonary circulations in a continuous way without having to jump from image to image to image to image, if you try to do it in still pictures. So I think that again that this is an instance where animation is good for showing the function of things.

JG: How do you see it? And will Yolŋu recognize it? How would Yolŋu see the blood story? How would they see it?

R: And again, this is just normal, these are ways of explaining the normal circulation so I've got a couple of questions for you, I mean, do you think that that's a simple enough explanation to be readily able to get across to people? I think that there are reasons why it's good for people to be able to understand that because then it will be easier to understand how arterial disease from eating too much fatty foods and hardening of the arteries and all that sort of thing mainly affects the systemic circulation and the carrying of oxygenated blood to organs, and that's why if you get peripheral vascular disease in your leg you might have to have your leg cut off, because the tissues aren't getting enough oxygen because the blood supply is not good enough and it will die and become gangrenous. Or you might have to have an operation so that the surgeons go in and widen that artery to improve the blood flow carrying the oxygen to the tissues of the foot which is keeping the cells and the tissue of the foot alive. It's easy enough to think about those great big blood vessels, the ones that you can feel the pulse of in your groin but you've got to remember that there are all those little capillaries that carry the blood out in the tissues, and it's those capillaries that get affected in diabetes and that's why people with diabetes get ulcers because the cells in those tissues die because they're not getting enough oxygen. So an understanding of the circulation is useful in explaining why people with diseased arteries get those sicknesses. I'd be interested to see what you think about those ways of explaining circulation, whether they're too complicated and whether there would be better, simpler ways of doing it.

JG How do you see it, how would you explain it, do Yolngu see that blood and heart work together or separate?

Dha: Yolngu will understand that.

JG: Do you understand now.

Go: No

Dha: Yolŋu understand the 'njiryun', in the way we are still alive.

JG: what do you say at the hospital?

RG: we tell some of the story, we interpreters get half the story from the doctors, not the full story,

RG: we don't know how the blood works,

Dha:

Frank: to the old people blood is life

Dhaŋ: Elders know it within themselves how the system works because there's a term that they use, njir'yun talking about their life.

R: Talking about their life? Yes.

Dhaŋ: ... and they show ... It's in the ;medical way, showing the circulation of the blood. The Yolngu, elders, blood is the main.

R: Yes. Is there a Yolŋu word for oxygen?

Dhaŋ: That we have to find out.

(Conversation in YM) inside ...4447 (YM) explaining. (YM) ...4518

JG: Can I go right back? If you're starting with something, ... if you're going to start making some type of resources where would you start? What would you start with when talking about circulation and breathing. Like, heart, lungs. What's the single most important thing to start with?

Dhaŋ;: Breathing Breathing. Breathing. Yeah. Yo, people would understand that because everybody knows what njir' is. Yow

4643

R: What would an elder say if I asked him how does the njir keep you alive. How does the njir make life. How? You say that an elder would tell me that njir is life, coming through. What if I asked him how, how does njir affect life, or why does njir keep you alive.

Dhaŋ: They would have the answers to that.

R: Would they have an answer? What do you think they might say.

Dhaŋ: I think they would. They would talk about food, or how we see the land, it's life..., and those kinds of areas, or ?? water, and they would tell you about water, and ancestral story of the journey it makes, all we're doing. ... the others ...

R: One, this area of the function or physiology of the body, some physiologists start to tell the story of an oxygen molecule, how the oxygen molecule started in the air and it got washed down into the breathed down into the lungs and then it walked across the membrane and got into the blood, and it got carried out into the tissues where it got burnt in a fire to make energy. I have heard balanda use that story as a way of teaching ... how oxygen keeps tissues alive. But does that make any sense in Yolngu culture? Because you have to understand all those other concepts as well.

4833

Dhaṅ: There could be some explanation but this is just the start of everything, and if we sit down, we have got heaps of responsibility.

R: Yes.

Dhaṅ: Thinking caps off, for our break..

JG: So should we leave it there and you guys can have a think about it,

Dhaṅ; And sleep on it ... dream about it. Mah.

JG: Thinking about how you would explain it and maybe tomorrow tell us how you would go about it.

Dhaṅ: Do it in pictures.

JG: make it small, not big

Mun: Yes simple, easy to understand 5043

Dhaṅ; for the old people. Is this finishing? I want to go to the postoffice,

?????? 5133

Making taxi arrangements,

R: Can I just, ... everybody, I'd like to thank you for your help today and have a think tonight about some of those things. Tomorrow we'll talk about the disease ones, okay.5436

(Conversation in YM) ... We'll come back tomorrow. Thank you.

R.: Good bye.

M? No.

R: We'll have to do a slide on it but I'll ask you to fill it out tomorrow.

M? On the sorts of practices

R: Just the principles of how, we've got to use visual things, if we use metaphors it's very helpful.

M?: Yeah, we can certainly work something out like that, yeah.

R: And sort of try and instill some general principles that cultural education ...

M: Yes, I'm sure there's a lot of work that's been done on it.

END OF DISC 4