EVucation: Freely available interactive public engagement tools for scientists to communicate the role Extracellular Vesicles in the body and healthcare.

Created by: *Ryan C Pink (rpink@brookes.ac.uk & @drpink), Findlay Bewicke-Copley, Paschalia Pantazi, Bianca Paris, Priya Samuel, Dave RF Carter*
(All at Oxford Brookes University)

Website link: https://www.ukev.org.uk/public-engagement-materials/

Why:
It is widely understood throughout international science and technology that public engagement is required for healthy scientific research dialogue and a deeper public understanding of its importance. This engagement is fundamental in a growing field such as Extracellular Vesicles (EVs), especially with its potential impact on the public through novel diagnosis and treatment.

What:
Here we present a set of freely available interactive public engagement tools to provide an 'off-the-shelf' kit to help scientists communicate the diversity of EVs in the body and their beneficial role in healthcare.

How:
These have been designed with the following thoughts in mind to maximise interaction:

- They are messy
- They are colourful
- They are cheap
- The messages are simple, but allow further discussion
- They are short to be hold attention at events
- They are developed with information to communicate to the targeted age group and their parents.

Key Engagement point for the adult: You can explain that **cells release small 'balls'** called vesicles that **communicate from cell to cell** in both **normal and disease conditions**, and that **proteins on the surface** call give us information on what **type of vesicle** it is ('Exosome Monsters') and **Where it is from** ('squishy blood'), and by **profiling the information of RNA**

and protein found inside the vesicles we can investigate the **function of the vesicle** and even use it in **diagnosis of disease**.

These have been tested at various science festivals. The PDF instructions to recreate these along with downloadable computer program and supporting posters are available from the UKEV website: https://www.ukev.org.uk/public-engagement-materials/. We also propose to use this site as a two-way resource in which others are welcome to add their own public engagement ideas. Therefore, email us if you have any you want to add or that you think we can improve on.

The availability of such tools will help disseminate the excellent work being done by the EV community and will increase its impact on the wider public.

The Engagement Tools:

There are three activities that have been developed to match a specific age group or UK schools Key stage. These are given a page each for easy printing.

‘Exosome Monsters’ - Key Stage 0, ages 3-5

Basis: *children decorate Card discs for badges or polystyrene balls for fridge-magnets while we explain to the child about cells and adults about EVs surface diversity*

Setup: Cardboard is cut to about 4-inch diameter (use a glass to draw round) and safety pins are sellotaped to the back, so they work as badges.

Method: Children are asked if they want a badge or fridge magnet monster! You give them a choice of eyes and let them decorate them as part of messy-play.

Key Engagement point for the child: For the younger ones then the concept of EVs and cells is quite difficult but by the age of 5 then the explanation of the body being made up of cells with different things stuck to them and moving round the body is achievable. If they understand this then you can move on to explain the stickers on the outside are like proteins that the body can use to transport the cells to the right place. Although at this age just let them have fun and speak to the parents.

Additions to the activity: You can make the badges and balls more exciting by covering them in silver foil first, or getting the children to cover them in glue and dip them in glitter.

Equipment list: Cardboard, Scissors, safety pins, Self-Adhesive Magnets Dots 12.5mm (£3 for 100, ebay), Polystyrene 8cm Half-Spheres (£4 for 20, ebay), colourful sticker mixes – stars, foam shapes, googly eyes (£4 for 200, ebay), felt tip pens.

‘Squishy Blood’ - (Key Stage 1-2, ages 6-11).

Basis: Putting their hands in the slimey red blood beads, t*hey pull out the coloured bead-vesicles and match them to the the organs they are from, while we explain about the specifically loaded EV contents and how we can use that information in healthcare*

Setup: The beads are for flower-arranging normally and require being soaked in water overnight to make them swell.

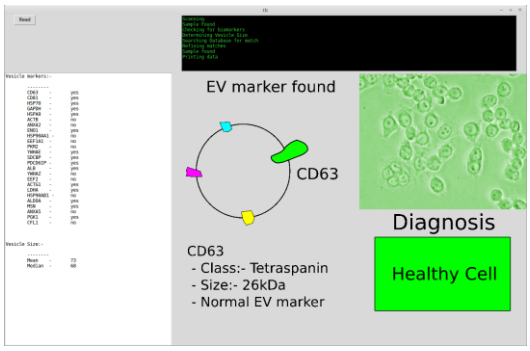
Method: A tub is filled with the red coloured beads, representing blood, and a number of different coloured beads are added. The children have to put their hands in the slimy and squishy beads and pull out the coloured vesicle-like-beads to match to the organs of the body by putting them in colour coded cups on the body map. Once finished you can pour them back into the blood. After a couple of hours of constant handling the beads tend to break so may need replacing.

Key Engagement point for the child: explain about how we can look at what is on and in the beads to give us information on where they are from and maybe can be found in/out blood when we get an illness.

Additions to the activity: You can add in extra colours and explain that there is always a real mix of vesicles in the blood and we some might just be from the food we eat (Low Density Lipoproteins).

Equipment list: Body poster, pots for coloured beads, tub for beads, mixed coloured 2cm Orbeez water beads (£4 for 1000, ebay), Red 2cm Orbeez water beads (£4 for 1000, ebay), baby wipes, dustbin bag.

‘Exosome health scanner’ - (Key stage 2+, ages 8 – adults)



Basis: *The audience pick a barcoded ball (blood EV) at random and scan it on a camera linked to a computer running a pseudo diagnosis programme giving out a clinical report, while we talk about how EVs are used in diagnosis and therapy.*

Setup: The Exosome Health Scanner software is downloaded from https://www.ukev.org.uk/public-engagement-materials/ onto a computer with a installed or USB webcam. Download and print the barcode sheet and cut them out to stick onto one half of the polystyrene balls/cardboard discs, using tape on one side and Velcro/adhesive magnets on the other (so it can be opened and closed). Colours these balls.

Method: A blood vesicle-like-polystrene ball is taken from a large pot at random and the child/adult is asked to open it to revel the barcode. They then hold it over the camera and watch for their diagnosis. ‘Return’ button or clicking the ‘Reset’ button then resets the programme to scan mode for the next participant.

Key Engagement point for the child/adult: We regularly profile the RNA and protein inside blood vesicles as that tells us something about how these vesicles do their various roles in healthy people or in disease states such as cancer. There are many developments on fast diagnosis and disease monitoring using these differences.

Equipment list: Laptop, USB webcam, download software (https://www.ukev.org.uk/public-engagement-materials/), Polystyrene 8cm Half-Spheres (£4 for 20, ebay, pots pull out polystyrene vesicles, printed barcodes for inside vesicles, colouring pens, Velcro and sellotape.