

Parasites VR – Manual

How to setup and use the Parasites Virtual Reality experience



v1.0

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1 Required equipment and software

Before using the Parasites VR experience, please note that it requires certain equipment and software to function. These can be categorised as:

- **A virtual reality headset** – The device that users wear upon their heads that houses the screens for each of their eyes. Some also include inbuilt headphones for sound.
- **Virtual reality controllers** – The handheld input devices that allow users to interact with the VR experience.
- **A high-spec computer workstation** – A powerful computer, typically setup for computer gaming or computer aided design (CAD).
- **Virtual reality driver software** – Software that allows VR experiences to be viewed on attached VR headsets.
- **ParasitesVR software** – The actual Parasites VR experience software.

The consumer VR headsets that the Parasites VR experience is compatible with are:

- **HTC Vive** - <https://www.vive.com/au/> - Comes with the VR headset and two VR controllers
- **Oculus Rift** - <https://www.oculus.com/> - Comes with the VR headset and two VR controllers

The high-spec computer workstation should at minimum satisfy the following specifications:

- **CPU** - Intel Core i5-4590/AMD FX 8350 equivalent or better
- **GPU** - NVIDIA GeForce GTX 1060, AMD Radeon RX 480 equivalent or better
- **RAM** - 4 GB RAM or more
- **OS** - Windows 10
- **Display monitor** - Initiate and display the VR experience
- **Keyboard & mouse** - Additional workstation control
- **Audio output** - Speakers or headphones to hear audio generated by the VR experience

The high-spec computer workstation should also have the following VR driver software and Parasites VR software installed:

- **Steam** - <https://store.steampowered.com/about/>
- **SteamVR** - <https://store.steampowered.com/app/250820/SteamVR/>
- **ParasitesVR** - <https://cloudstor.aarnet.edu.au/plus/s/5ZU5C7IJGI0vLzk>

2 Setting up the VR equipment

Each of the consumer VR headsets have their own individual guides to setting up their equipment. These are:

- **HTC Vive Installation** - https://support.steampowered.com/steamvr/HTC_Vive/
- **Getting Started With Your Oculus Rift** - <https://support.oculus.com/857827607684748/>

Please consult the detail in each guide for setting up the preferred VR equipment. To summarise these guides:

1. Connect the VR headset to the high-spec workstation via a display output from the workstation's graphics card, and an available USB port.
2. Place and configure the tracking system (powered Lighthouse stations for the HTC Vive, USB infrared cameras for the Oculus Rift).
3. Once all equipment is connected, configure the VR play space (*Room Setup* and *Chaperone* for HTC Vive, *Oculus app* and *Guardian* for Oculus Rift). This is an important safety measure that allows the boundaries of the VR play space in the real world to be defined, and serves as a warning system for users who are about to collide with real world objects and walls that don't exist in the VR experience. This VR play space boundary is visible only to the users as blue lines within the VR world.

Video guides for setting up each consumer VR headset also exist:

- **HTC Vive** - <https://www.youtube.com/watch?v=QHei7r6sMao>
- **Oculus Rift** - <https://www.youtube.com/watch?v=bmGNkImQ9VA>

3 Parasites VR roles

Before explaining how to use the Parasites VR experience, it is beneficial to provide some context about the roles used in this guide. Whilst the remaining instructions in this manual serve as a guide on how to use the VR experience, it will be done so with specific references to the following roles:

- **Users** - Those who are wearing the headset in and immersed *inside* the VR world.
- **Facilitators** – Those who are *guiding* the **users** that are immersed *inside* the VR world, and are **not** immersed in the VR world themselves.

Typically the VR experience will either be used by just a *single user*, where they start and use the VR experience themselves in a solitary manor without any external guidance, or used by a *user* and a *facilitator*, where the facilitator guides the user through the VR experience. The user/facilitator scenario is most frequently used as this is more suited to situations where the VR experience is being shown to a group of people, each one after the other assuming the *user* role, and the group have varying previous experience with VR equipment (ranging from no experience to much experience). The responsibilities of the facilitator role could also be satisfied by multiple people guiding the users through the VR experience.

It is recommended that the facilitator be already familiar with the content of the VR experience, and have prior knowledge of what it is like to be a user to be able to assist adequately. If it is not possible for a facilitator to experience the content themselves, a [video walkthrough](#) can be also be viewed instead (it is not recommended to show users this video walkthrough prior to using the Parasites VR experience as it will remove the element of discovery). It is also recommended that in the user/facilitator scenario that audio speakers be used instead of headphones so that the facilitator can effectively communicate with each user throughout the VR experience.

Unless specifically stated by a **Facilitator:** section, all remaining instructions refer to how to use the VR experience as a *single user*, or just the *user* role in the user/facilitator scenario. If the VR experience is only being used by a single user, the facilitator specific instructions can be ignored.

4 Starting the Parasites VR experience

Once the required equipment has been setup and the required software installed, the following icon should be available on the desktop, and via the Start Menu under **Federation University Australia**:



Double-click the icon to begin the Parasites VR experience.

Facilitator:

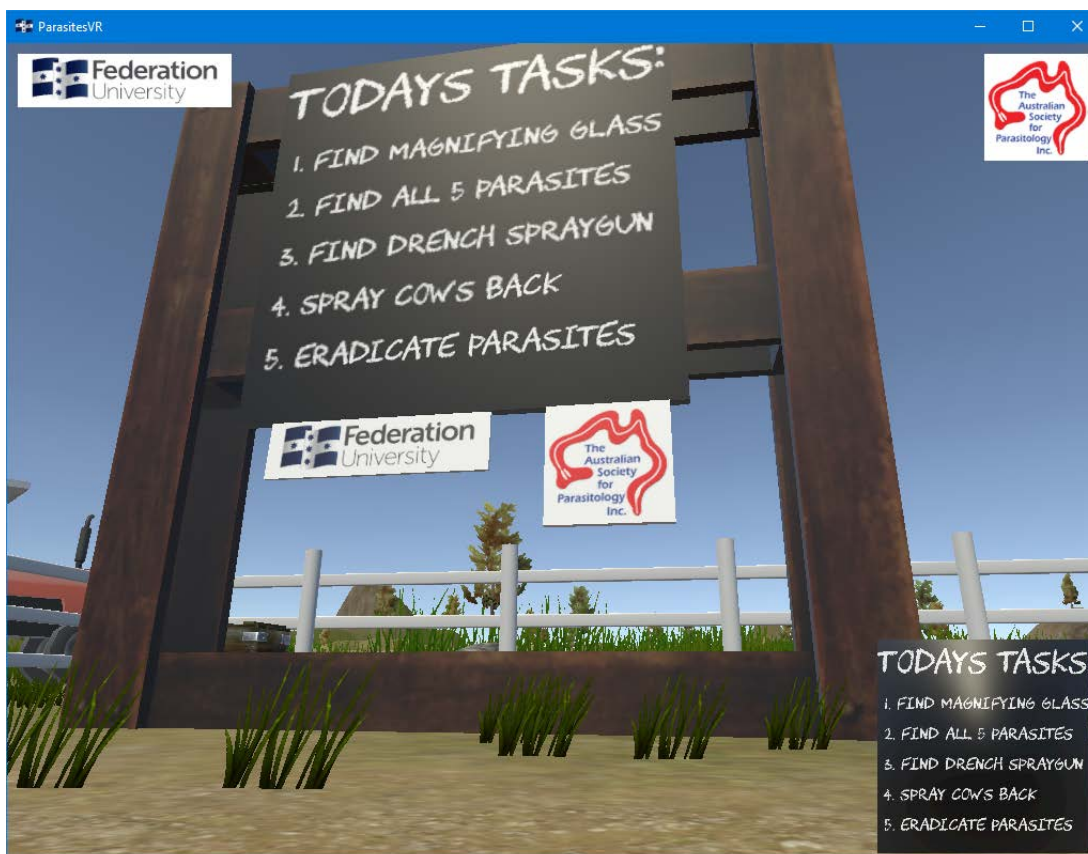
After the Parasites VR experience has been started, it is not required to close and restart for each subsequent user. Upon each user completing the VR experience (see [5.3](#) for how users complete the VR experience), all objectives will be reset ready for the next user. If more control is desired by the facilitator (eg. manually resetting or exiting the VR experience), see [5.4](#) for the keyboard commands that the VR experiences accepts.

Before each user straps on the VR headset and VR controllers to enter the VR world, it is recommended that facilitators brief users on their familiarity with VR equipment in general, and also how to use the VR controllers, and how to complete the VR experience objectives. It is also recommended that for extra safety that the facilitator explains the VR play space boundaries (the *blue lines* within the VR world), and that they represent real-world obstacles and to ensure they don't move outside them. Suggestions for these are:

- **"Have you used any VR equipment before?"** – This will allow the facilitators to know if the users need extra guidance on using the VR equipment if they have no prior experience.
- **"If you see any blue lines, stay away from them!"** – This will let the users know that they should stay within the VR play space boundaries.
- *See the facilitator sections in [5.2](#) for suggestions of what facilitators can give to users on how to complete individual objectives.*

5 Using the Parasites VR experience

Once started, the Parasites VR experience will be displayed both in the users' headset and on the display monitor. Depending on the position of the headset, it will look something like this:



Facilitator:

If the display monitor is connected to a large screen, or multimedia projector, for the purposes of showing the entire group what the user is seeing and doing, the window on the display monitor can be maximised to a full screen view using the standard Windows maximise button on the window frame.

Note that throughout a session of assisting multiple users from the group through the VR experience, facilitators will likely be doing these tasks, often simultaneously:

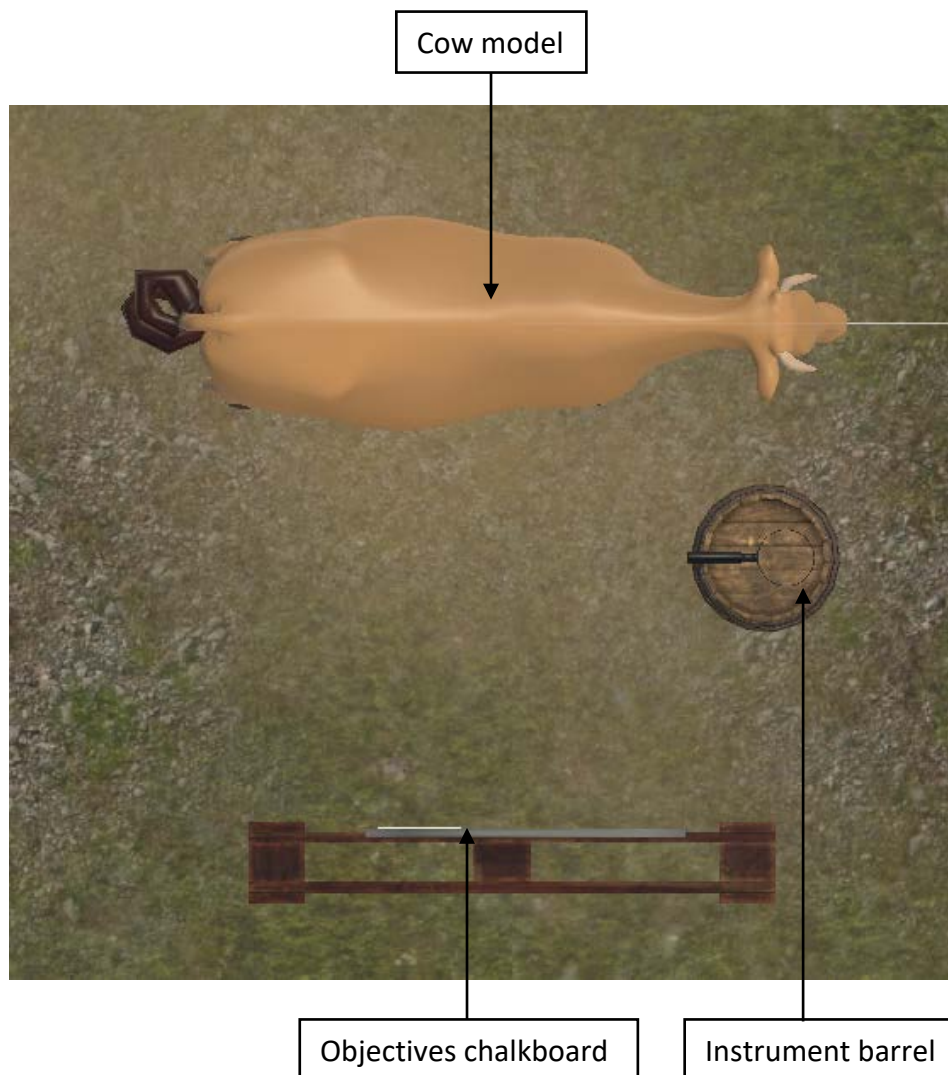
- Watching the display monitor to see what the user can see.
- Watching the users themselves so that they don't run into any real world objects or walls.
- Moving the VR headset cables (if not wireless) to ensure the users do not trip or get tangled up.
- Talking to the users about their experience, and assisting when needed.

5.1 Important Parasites VR scene objects

The VR world inside the VR experience was designed to look, sound and feel like a typical rural farming scenario. It is populated by many different objects, such as animals, buildings, trees, and farm machinery. Most of these objects exist to only visually and audibly set the scene, are static and can't be interacted with. There are however several important scene objects that the user can either interact with, or provide important visual feedback. These are:

- The instrument barrel
- The cow model
- The objectives chalkboard

Viewed from the top of the farm scene, here is where these important objects are located:



5.1.1 Instrument barrel

On top of instrument barrel is where the instruments that users can pick up will appear. Users can pick the instruments up by simply touching them with either of the VR controllers that represent their hands in the VR world. They do not need to be picked up by a specific VR controller, allowing users to pick up the instrument with whichever is their preferred hand. Once an instrument is picked up, it will replace the VR controller as representing their hand in the VR world. If users are already holding an instrument and another instrument appears on top of the instrument barrel, they can swap the currently held instrument with the other instrument by simply touching it, or pick it up in addition to the currently held instrument by touching it with their other VR controller. The instruments that will appear include:

- **Magnifying glass** – Enables users to peer through the magnifying glass lens, but does not provide any actual magnification. It does however provide x-ray like vision into the cow model so that user can see the internal anatomy of the cow (skeleton, lungs, stomach, etc), and the parasites living within the cow. See [5.2.2](#) for more information on how to use the magnifying glass.
- **Drench spray gun** – Allows users to spray a chemical bath over the back of the cow model that eradicates the parasites from the cow. See [5.2.4](#) for more information on how to use the drench spray gun.



5.1.2 Cow model

The cow model is the main focus of the entire Parasites VR experience. When viewed without the magnifying glass, it is a static and motionless model. Even if the users opt to look inside the cow model with their headset (pushing their heads through the walls of the cow model) they will only see the cow model as it currently is. It is not until they pick up the magnifying glass and peer through it at the cow that they can see how to complete the required objective. See [5.2.2](#) for more information on how to use the magnifying glass to complete this objective.

5.1.3 Objectives chalkboard

The objectives chalkboard exists as a reference tool for users in the VR experience to visually check at any point in time what objective they are currently completing. As each objective is completed, they are automatically crossed off in **red** as being completed. It also shows more detailed sub-objective completion status for the 5 parasites found. See [5.2.2](#) for more information on how these sub-objectives are displayed on the objectives chalkboard.



5.2 Parasites VR experience objectives

To complete the Parasites VR experience, users need to complete in sequence a number of objectives. There are no time limits or scores, however each objective must be completed before the next objective can be attempted. At any one time users will be attempting only one of these objectives. The objectives are:

1. Find magnifying glass
2. Find all 5 parasites
3. Find drench spray gun
4. Spray cow's back
5. Eradicate parasites

Facilitator:

To assist in knowing what objective users are currently attempting, the window on the display monitor contains a live and always visible preview of the completed objectives chalkboard in the lower right corner:



This preview is not visible within the headset, users will need to turn their headset to the actual objectives chalkboard in the VR world. See [5.1.3](#) for how the completed objectives are represented on the chalkboard. This can assist the facilitator to guide users on what to do next should they require any help at any point in time.

Some of the objectives will produce a visual and audible cue that the objective has been completed successfully. For objectives 1-3 the cues resemble a rainbow coloured particle effect, and are accompanied by a recognisable *coin collect* chime sound.

5.2.1 Find magnifying glass

When users first begin the VR experience they will be located somewhere around the three important objects. They can see the entire farm scene around them, and will see the VR controllers representing their hands in the VR world. Their first objective is to find the magnifying glass and touch it to pick it up. It is located on top of the instrument barrel.

Facilitator:

If the user has had no prior VR equipment experience, it is recommended that they be encouraged to look all the way around themselves (in all 360°) to become aware that the VR world totally envelops them, and that they can walk in any direction (whilst not moving outside the VR play space defined by the blue lines). Then encouraged to look at their VR controllers so that they become aware of how the VR controllers represent their hands.

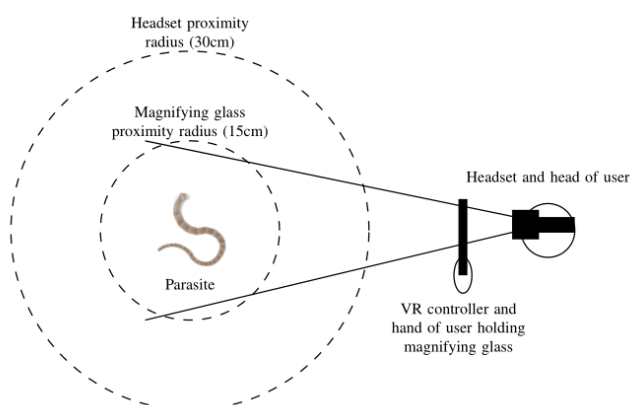
Suggestions for assisting users if they need help completing this objective:

- **"Find the magnifying glass"** – If users are unsure what to do.
- **"Look to your left/right"** – If users are not facing the instrument barrel.
- **"Walk to the barrel"** – If users are attempting to touch the magnifying glass and cannot reach it.
- **"Touch the magnifying glass with either of your controllers"** – If users are unsure how to pick up the magnifying glass.

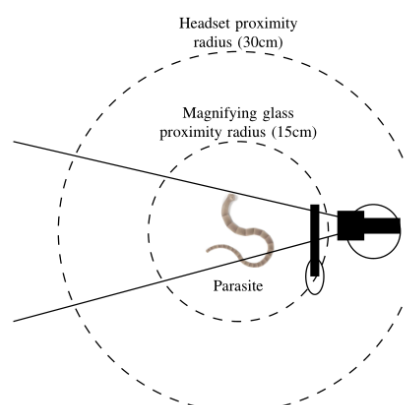
5.2.2 Find all 5 parasites

The most important and time consuming objective in the VR experience is finding the 5 different parasites that are located in the cow. In order to complete this objective users must find each of the 5 parasites located in and around the cow model. There is no order in which the parasites must be found, as long as all 5 are found. The magnifying glass is required to complete this objective, as it allows users to peer through its lens and see inside the cow with xray-like vision.

Users can possibly see any or all of the 5 parasites by simply peering through the magnifying glass at a distance from the cow model, however this will not be registered within the VR experience as having found each of the 5 parasites. Each parasite is registered as being found by users **closely inspecting** each parasite, sometimes even pushing their heads inside the cow model. The mechanism by which the VR experience registers the close inspection of each parasite is by the **proximity of the headset and the magnifying glass to each of the 5 parasites**. The headset must be less than **30cm** from the parasite, and the magnifying glass must be less than **15cm** from the parasite (as demonstrated in the figures below). This means that the users have to get physically close to the position of each parasite with their head and the hand that is holding the magnifying glass. This also means that users may be required to bend over, kneel down, or even get on their hands and knees to get their head and hand holding the magnifying glass close enough to each parasite to be registered as found. This is intentional and by design to encourage maximum physical engagement with the VR experience.

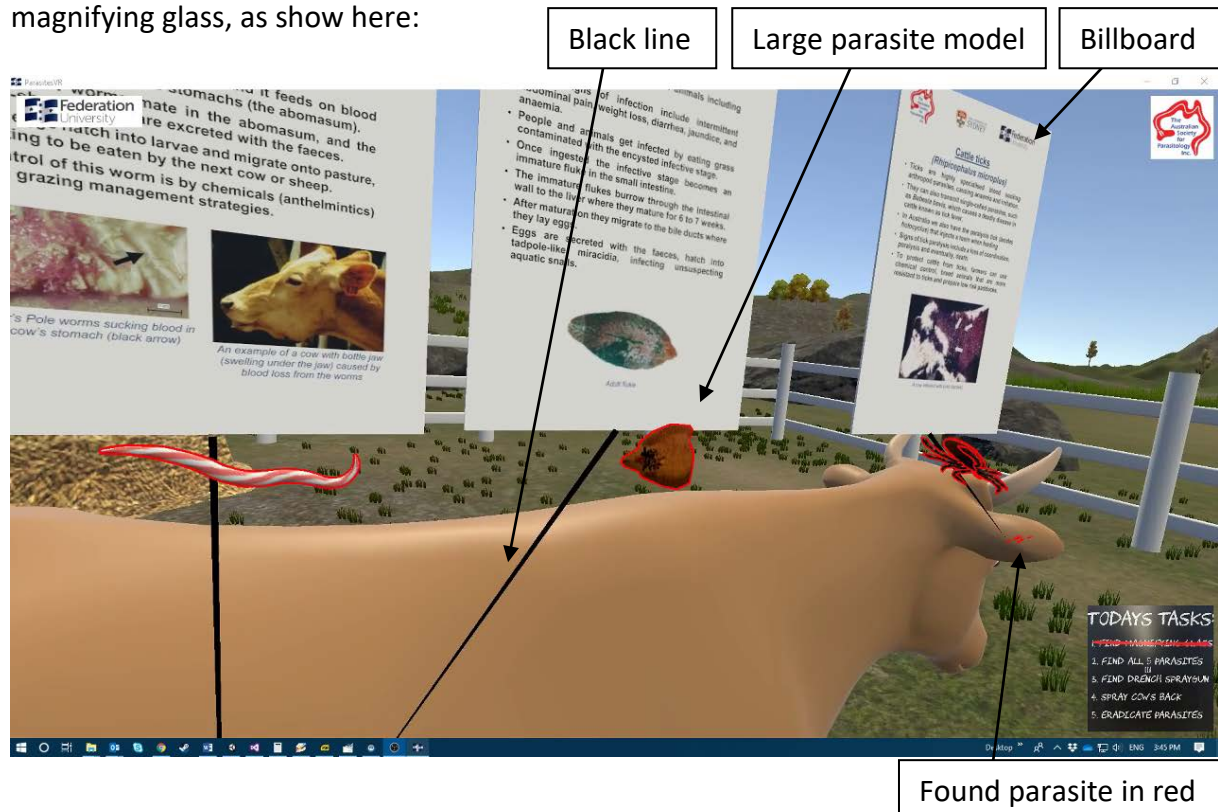


Parasites **not** yet registered as found, as the headset is **more** than 30cm from the parasite, and the magnifying glass is **more** than 15cm from the parasite.



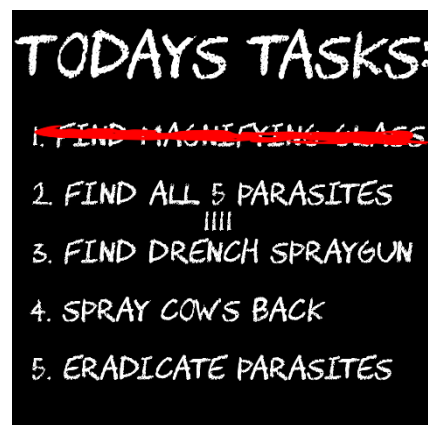
Parasite registered as found, as the headset is **less** than 30cm from the parasite, and the magnifying glass is **less** than 15cm from the parasite.

As each parasite is found, a billboard will appear above the cow model with a written description and pictures of the found parasite, and a narrator will be heard reading the billboard text. A larger parasite model will also appear at the bottom of each billboard, slowly spinning so that user can inspect the parasite in more detail. A black line will appear that connects the parasite location within the cow with its associated billboard, and the parasite models within the cow will now be highlighted in red and be visible without the x-ray magnifying glass, as show here:



These objects provide visual feedback about the parasites the users have already found. Upon completion of this objective, all 5 parasites and description billboards will be visible.

The objectives chalkboard also displays the status of how many parasites have been found (sub-objectives) in the form of tally marks located under objective "Find all 5 parasites", as shown here (4 parasites have been found in this case):



Facilitator:

It is recommended that users are shown how to register the parasites as being found before starting the VR experience, emphasising the requirement that they get in really close to inspect each parasite whilst peering through the magnifying glass. Facilitators can achieve this by “acting out” how to do it, pretending to hold a magnifying glass and bending down to see an imaginary parasite. Previous experience does unfortunately also show that even when users have had this procedure explained and acted out for them prior to the VR experience, they can still require further guidance on how to register the parasites as found during the VR experience.

It is also recommended that during the VR experience after users have completed the **Find magnifying glass** objective and starting the **Find all 5 parasites** objective they are reminded that there are 5 parasites in total to collect, and they can check the progress of how many parasites they have found by looking at the objectives chalkboard for the tally marks.

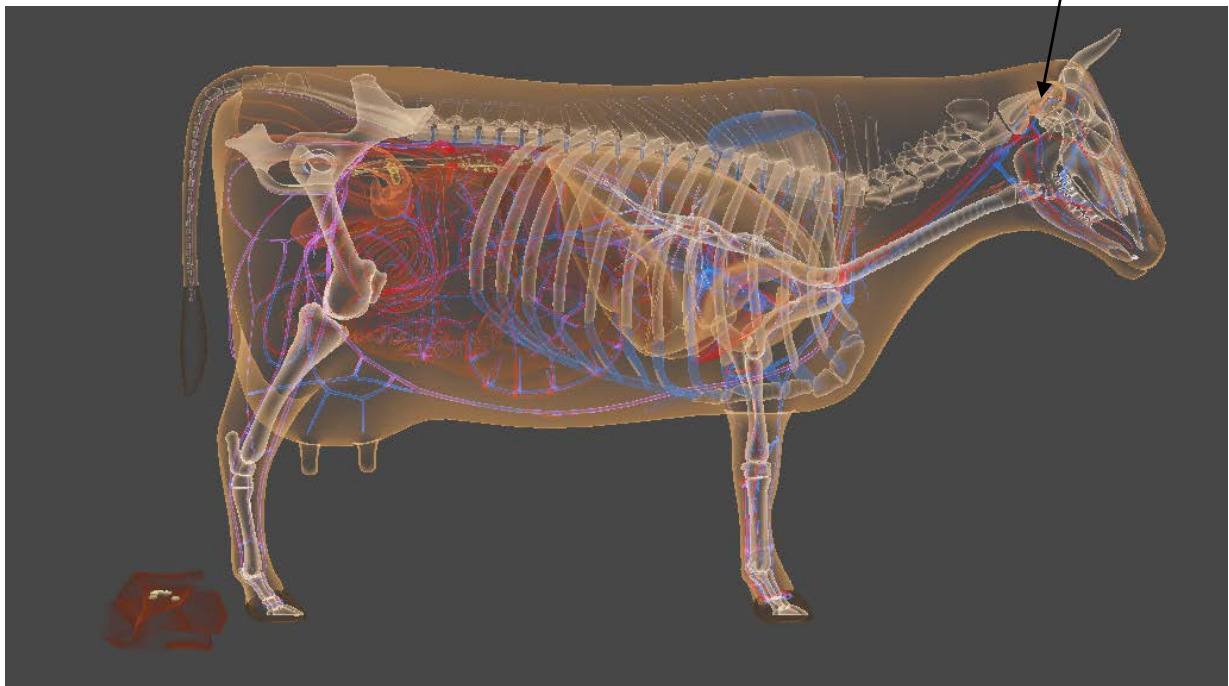
Suggestions for assisting users if they need help completing this objective:

- **“Look at the cow through the magnifying glass”** – If users are unsure what to do.
- **“Hold the magnifying glass close to your head”** – If users are having trouble seeing the parasites.
- **“Look for anything moving in the cow”** – If users are having trouble identifying what is a parasite in the cow, as the parasite models are animated.
- **“Get in really close with your head, bend down if you have to”** – If users can see a parasite, but the VR experience is not registering it as being found.
- **“Look above the cow”** – If users finds a parasite, but fail to see or read the revealed description billboard.

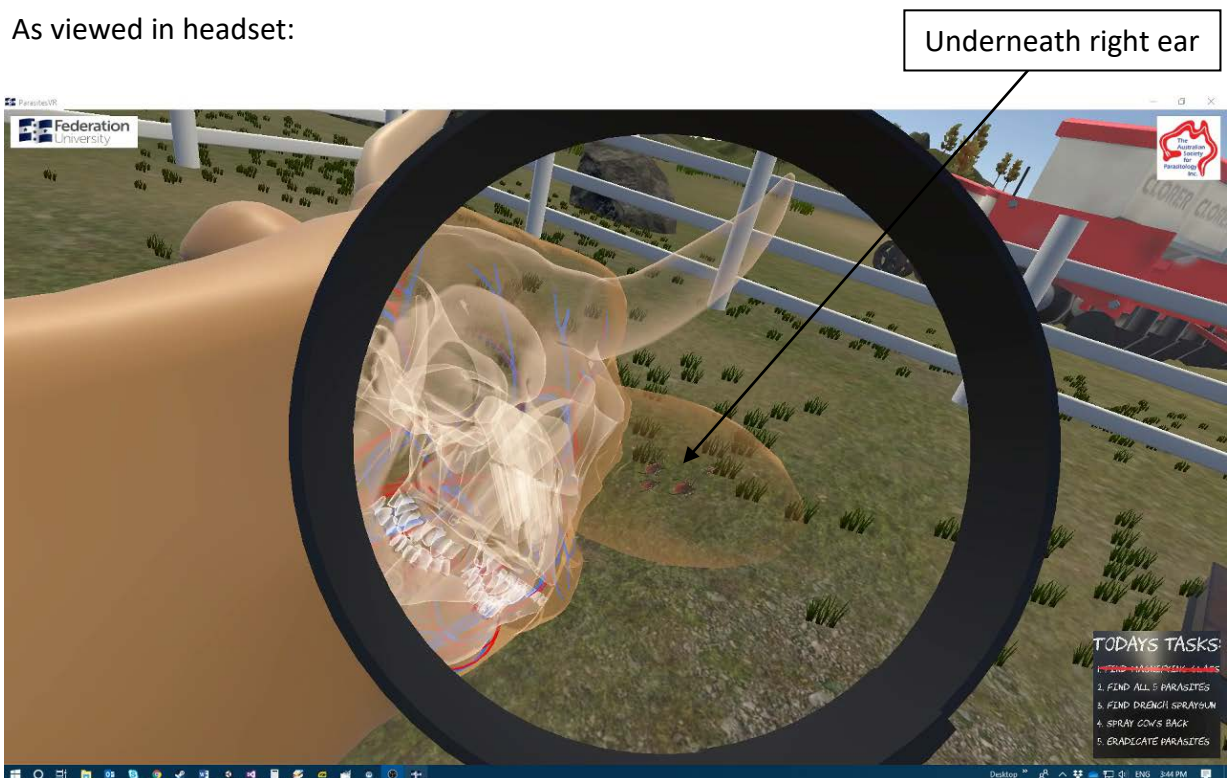
The following 5 sections detail where each individual parasite is located in the cow model, and as viewed through the headset.

5.2.2.1 Cattle ticks (*Rhipicephalus microplus*)

Location:

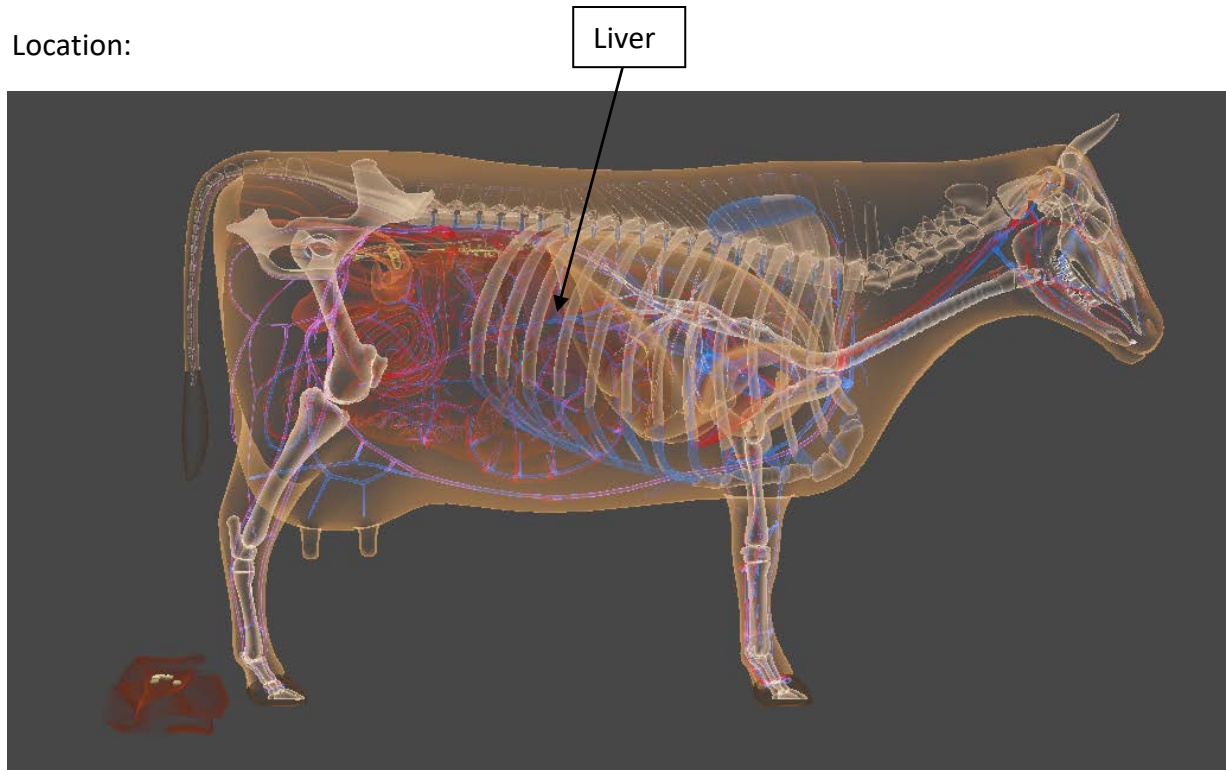


As viewed in headset:

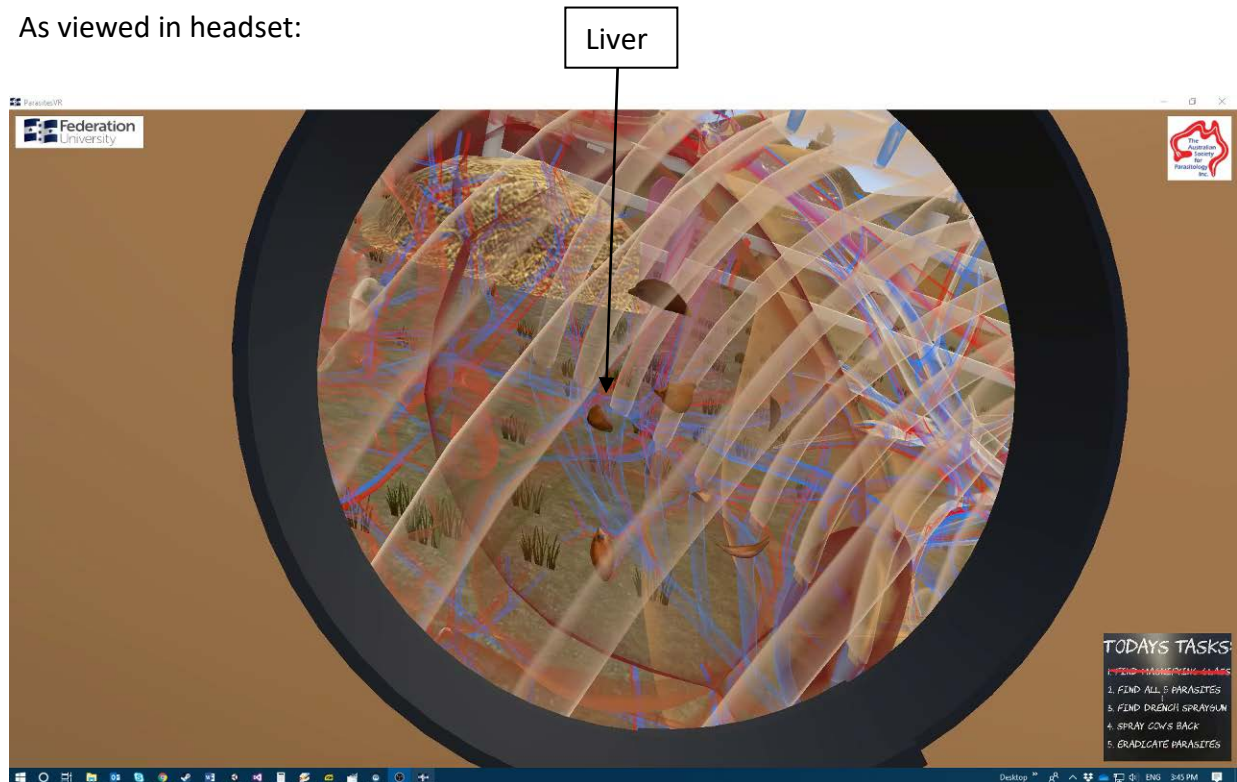


5.2.2.2 Liver fluke (*Fasciola hepatica*)

Location:



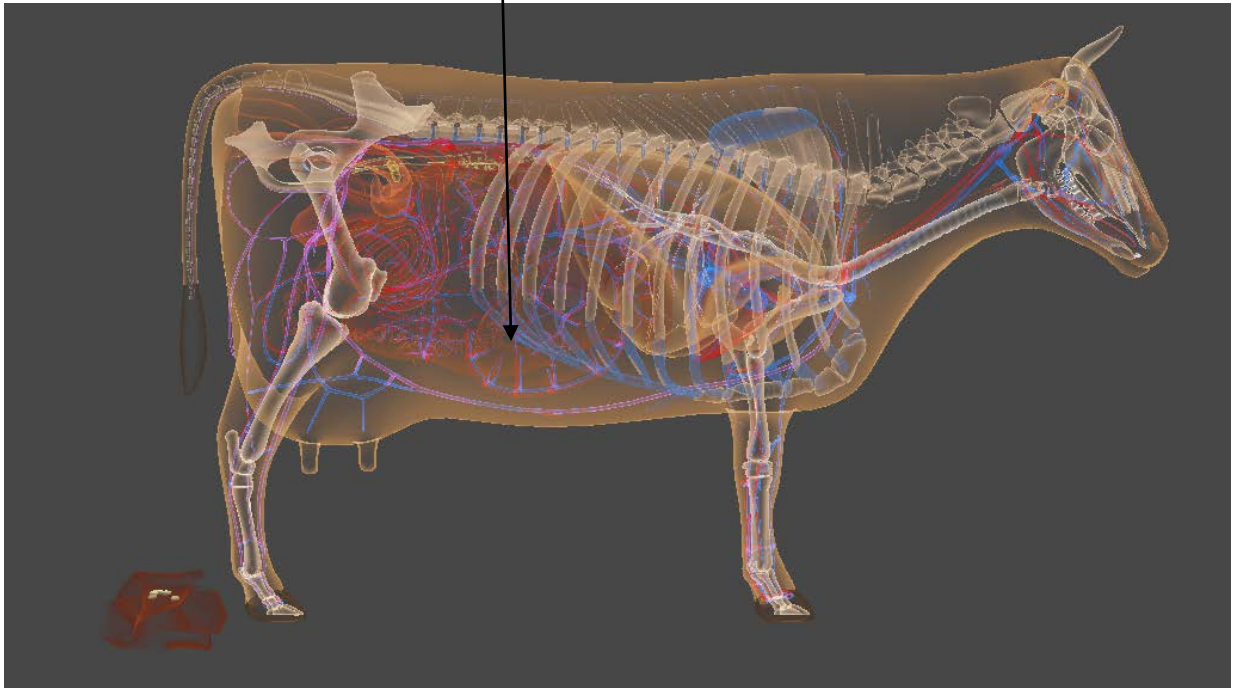
As viewed in headset:



5.2.2.3 Barber's pole worm (*Haemonchus placei*)

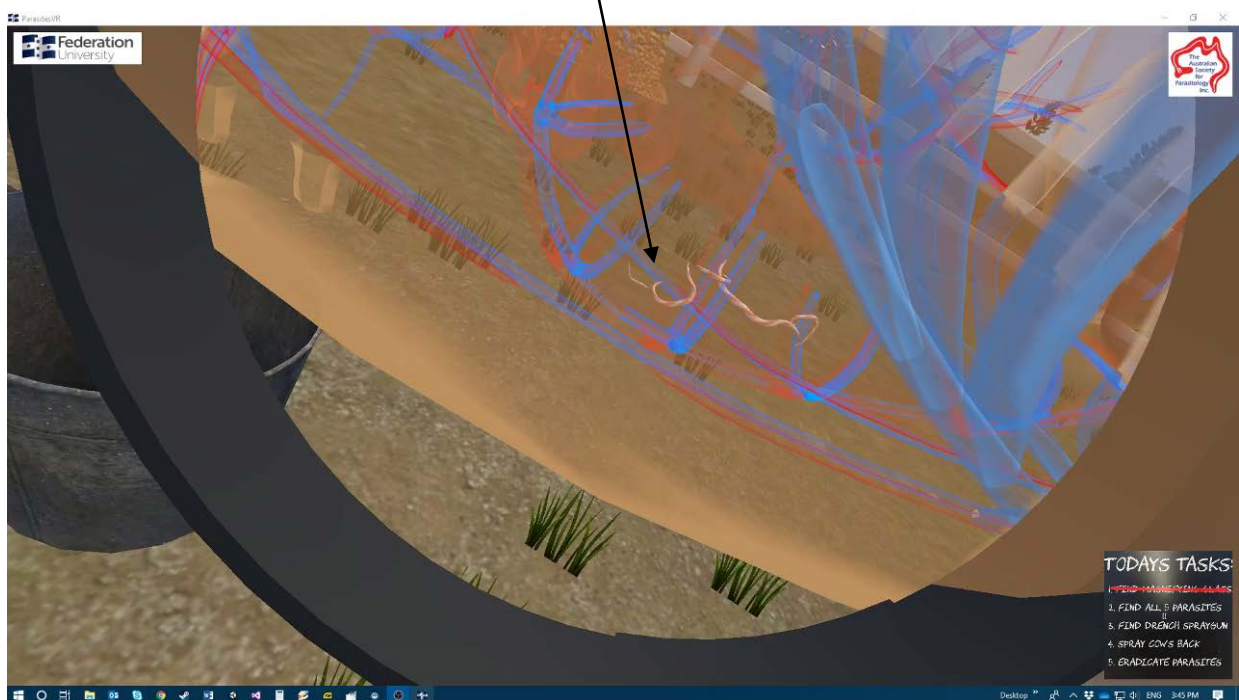
Location:

Abomasum



As viewed in headset:

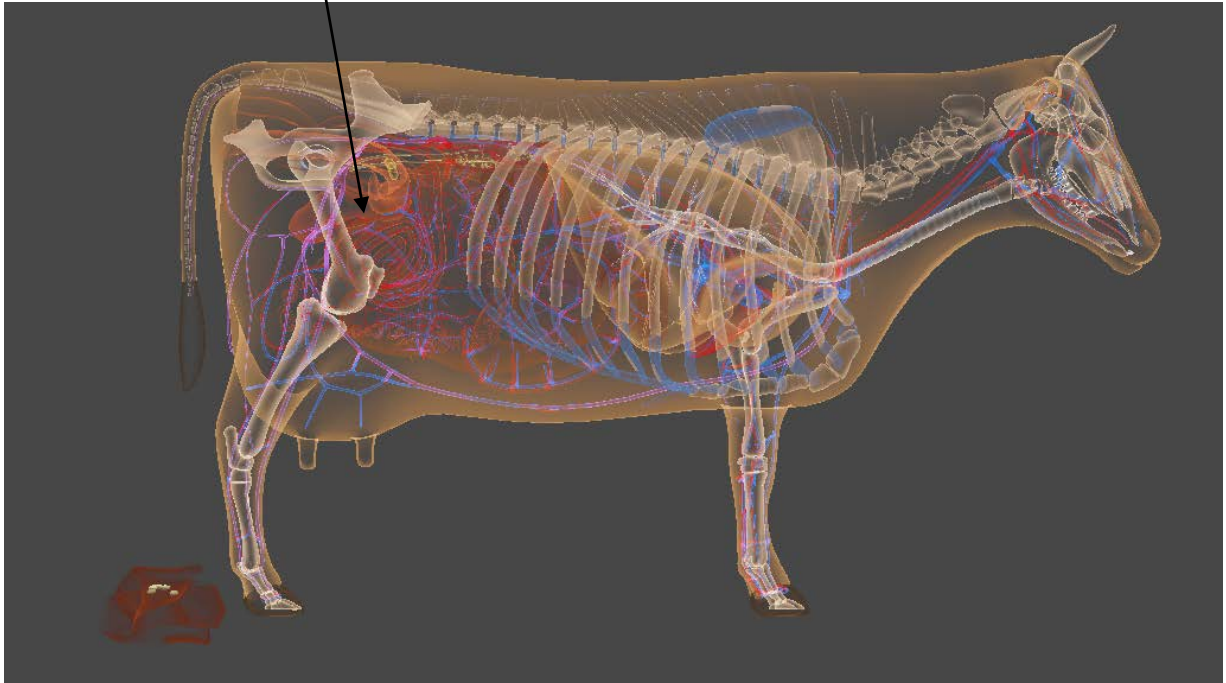
Abomasum



5.2.2.4 Ruminant tapeworm (*Moniezia expansa*)

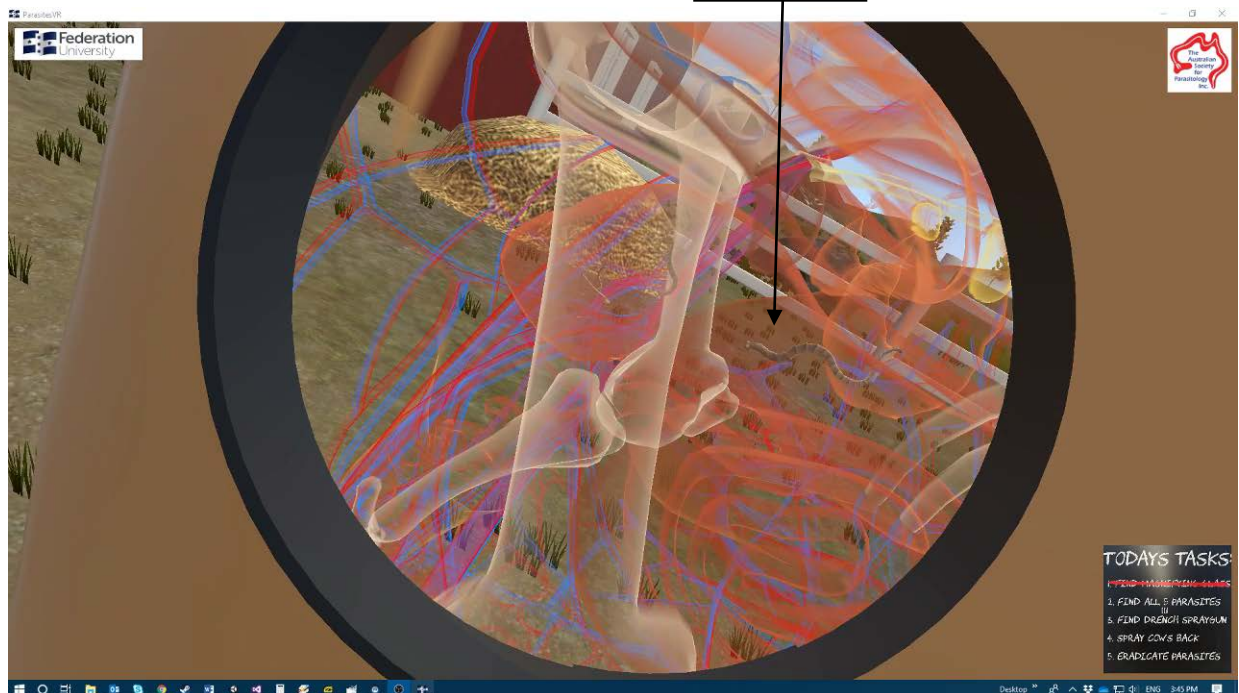
Location:

Intestines



As viewed in headset:

Intestines

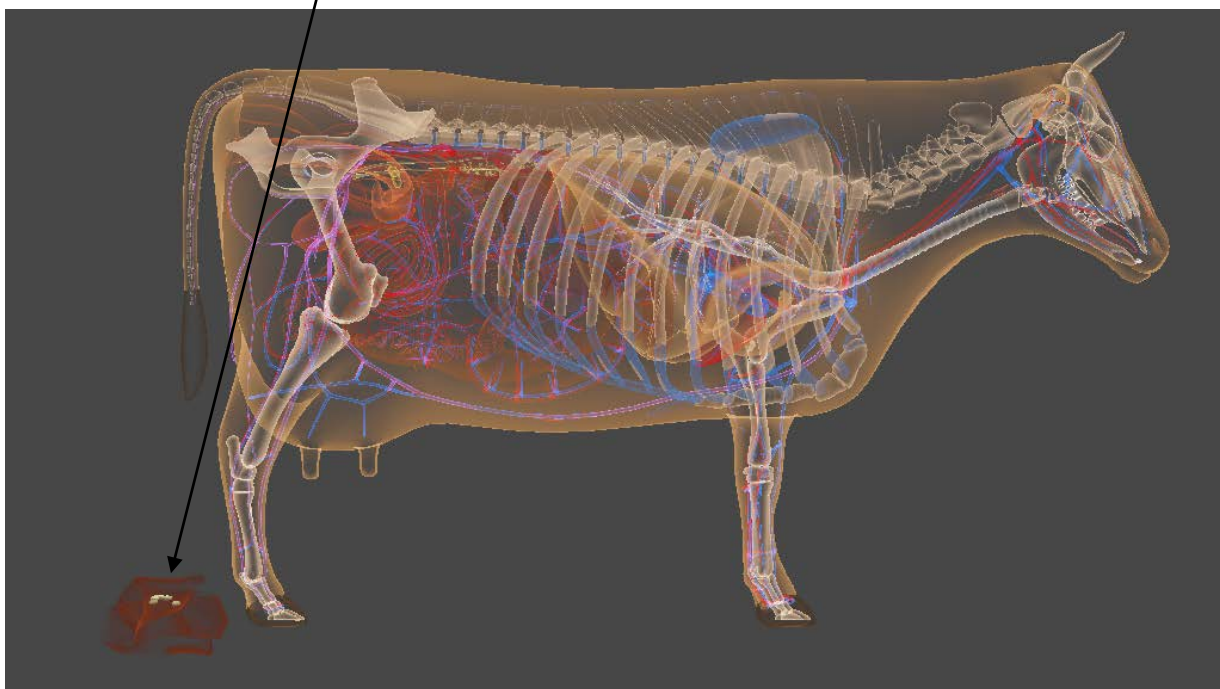


TODAYS TASKS
1. FIND ALL 5 PARASITES
2. FIND DRENCH SPRAYGUN
3. SPRAY COWS BACK
4. GRADUATE PARASITES

5.2.2.5 Parasite eggs (Strongyle eggs)

Location:

Faeces



As viewed in headset:

Faeces



5.2.3 Find drench spray gun

Once all 5 parasites have been found, users will still be holding the magnifying glass. The drench spray gun will now be visible and located on the instrument barrel. Users can touch it with the hand holding the magnifying glass, and the magnifying glass will be dropped and swapped for the drench spray gun, or they can touch the drench spray gun with their other unused VR controller to be holding the magnifying glass in one hand and the drench spray gun in the other hand.

After the drench spray gun is picked up, any narration still playing will cease, and the billboards above the cow will disappear.

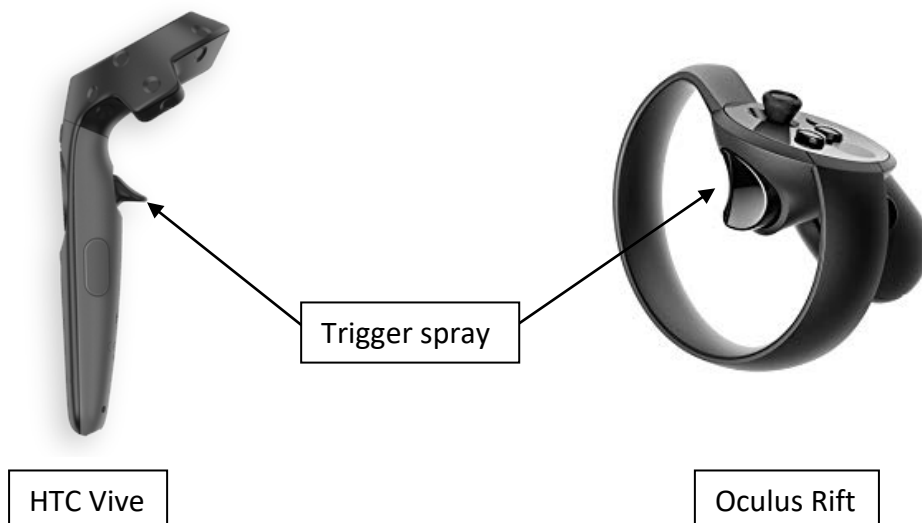
Facilitator:

Suggestions for assisting users if they need help completing this objective:

- **"Do you remember where the barrel was?"** – If users are unsure what to do or where to go.
- **"Touch the drench spray gun with either of your controllers"** – If users are unsure how to pick up the drench spray gun.

5.2.4 Spray cow's back

Having picked up the drench spray gun, users can now spray the back of the cow model to eradicate all the parasites that exist in and around the cow. The spray gun is operated by pressing the trigger on the VR controller:



Typically the drench is sprayed down the backline of the cow, however technically in the VR experience, the pattern of the drench spray is ignored. Users can spray any pattern they want, as long as they start spraying somewhere on the cow model. **Note: In practice (on-farm) one chemical won't eradicate all the different parasites identified in the cow.**



Facilitator:

Suggestions for assisting users if they need help completing this objective:

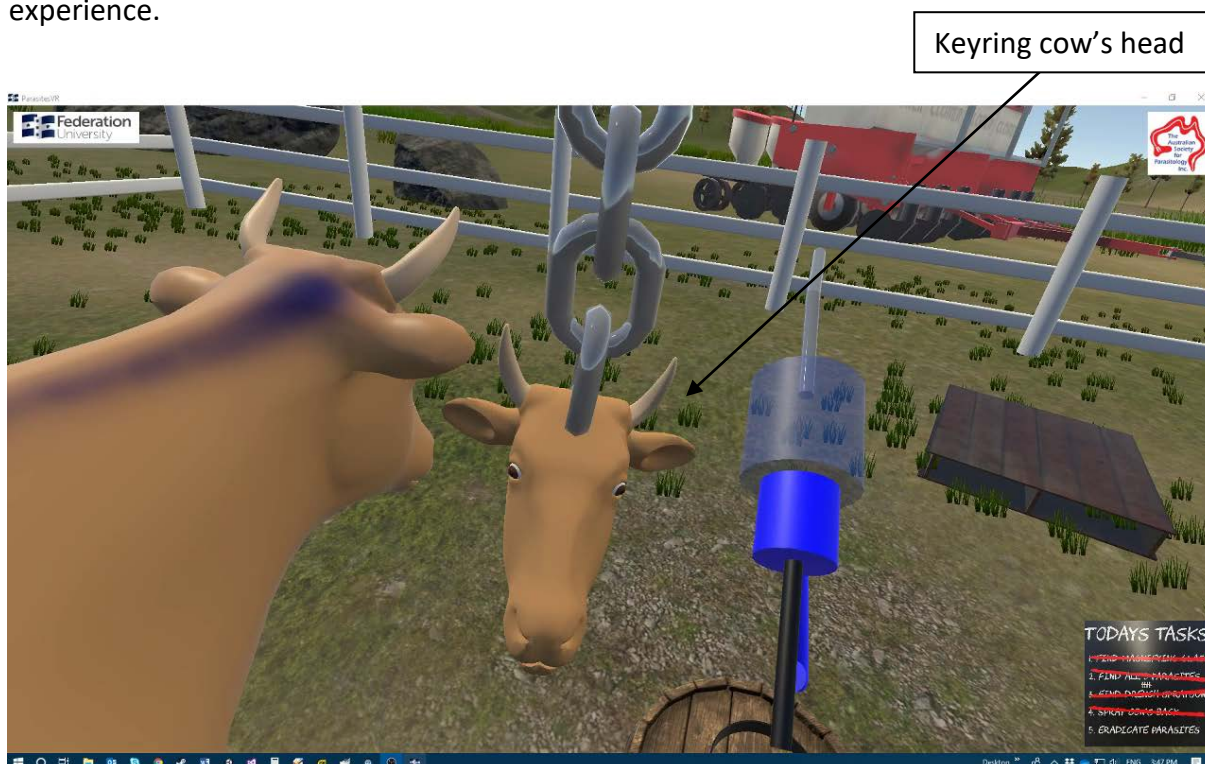
- **"Spray the cow's back"** – If users are unsure what to do.
- **"Press the trigger"** – If users are unsure how to spray the cow's back.

5.2.5 Eradicate parasites

This objective is the final objective for users to complete in the VR experience, signifying that all the 5 parasites have been eradicated from the cow. Each parasite located in the cow model will play the *coin collect* chime sound and display a small white particle effect to signify that they have each been eradicated. Users do not have to actually physically do anything to complete this objective, each parasite will be eradicated automatically in a random amount of time between **0** and **5** seconds from the first time the drench spray gun is sprayed on the cow.

5.3 Completing the Parasites VR experience

Once all objectives have been completed, a cheering crowd sound will be heard to signify that the VR experience has been completed. This is accompanied by the appearance of a keyring of the cow's head dangling from a chain in front of users, as if connected to the top of their head. Users need to touch the keyring cow's head with either of the VR controllers or drench spray gun, and the VR experience will be reset ready for the next user to begin their VR experience.



Facilitator:

Suggestions for assisting users if they need help completing the VR experience:

- **"Touch the cow's head"** – If users are unsure what to do.

5.4 Keyboard commands

The Parasites VR experience accepts the following keyboard commands:

- **Esc** – Exit the Parasites VR application
- **Space bar** – Reset the current VR experience. This resets all the positions of the objects and all the objectives back to the state at which the application first started, ready for a user to begin.

Facilitator:

Occasionally instruments that the users need to work with may end up outside the boundaries of the defined VR play space, or may be dropped in a location where they either can't be seen or picked up again. In this event, or any other event where users can't complete the VR experience or current objective, pressing the **Space bar** at any point in time will reset the VR experience back to the beginning, so that the current user can re-try the VR experience, or the next user can begin.

6 Credits

- [Evan Dekker](#) (Federation University Australia) – Software design and implementation.
- [Dr. Sarah Preston](#) (Federation University Australia) – Veterinary science and parasitology expertise.
- [Prof. Jan Slapeta](#) (University of Sydney) – USyd parasitology student feedback.
- [Nichola Calvani](#) (University of Sydney) – Annotation corrections.
- [Australian Society for Parasitology](#) – Community outreach and development funding.