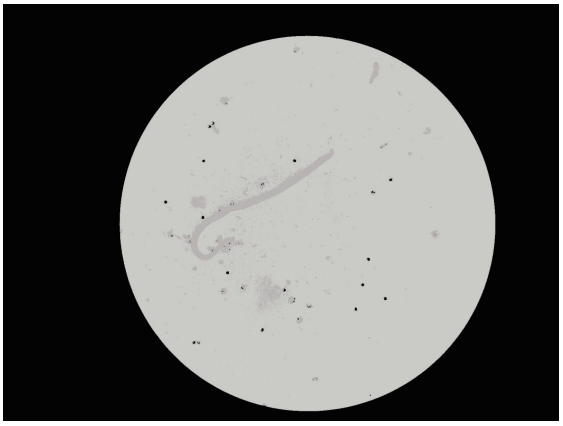
Datuluna Ali G. Dilangalen
2015-04685

March 15, 2018
CS 180 THR

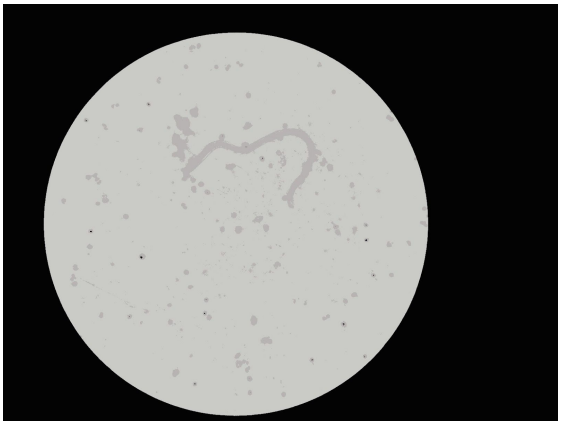
1. K-means with two random centroids

   Filaria

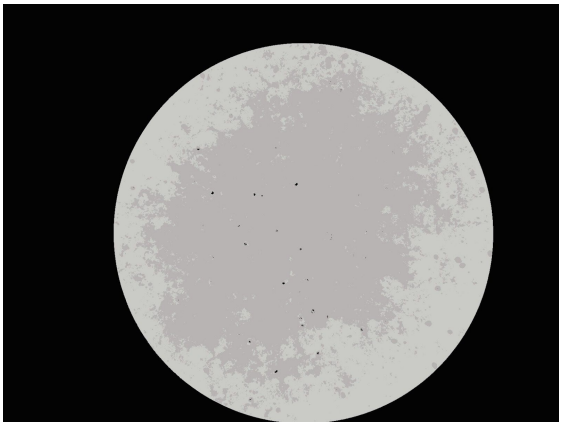
   In some of images; (a.), (c.), (d.), (i.), (h.), the shape of the parasite is capture. In (g.) and (j.), the parasite can be somewhat detected because but its color is clustered with the other surrounding elements, in others, the parasite can't be detected.



(a.)

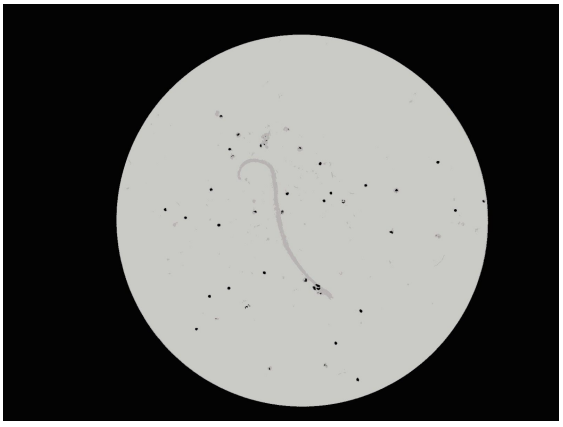


(d.)

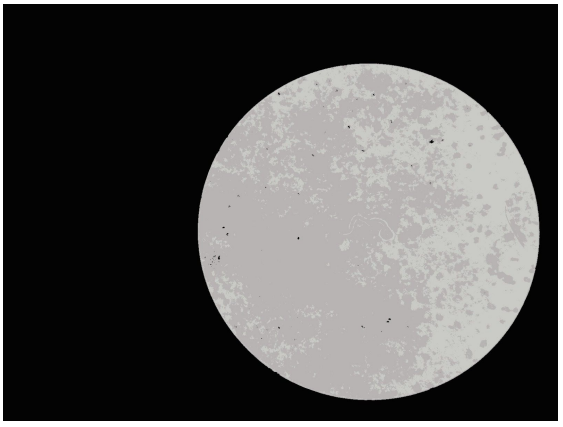


(b.)

(e.)

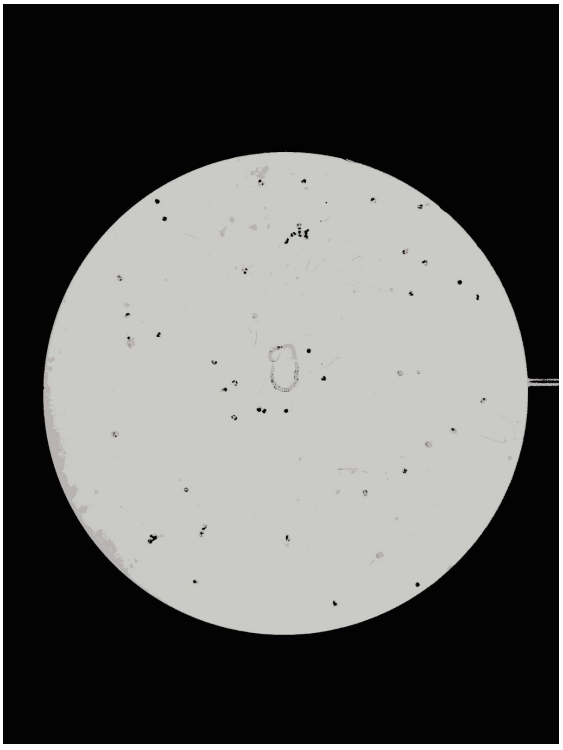


(c.)

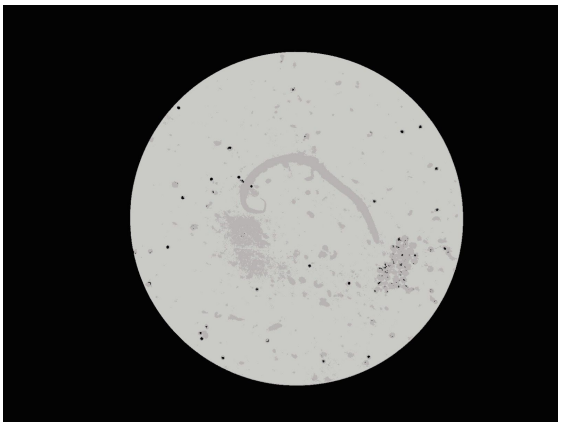


(f.)

(g.)



(h.)



(i.)

(j.)

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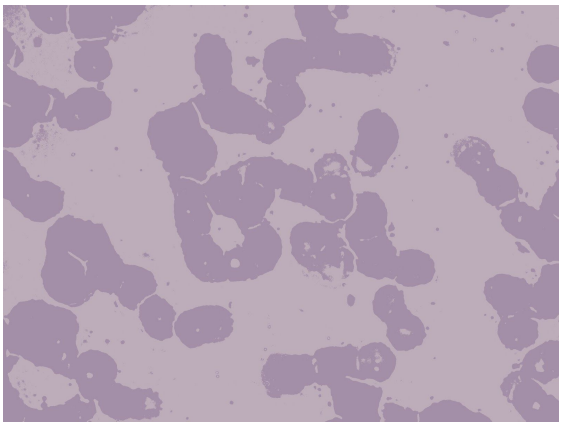
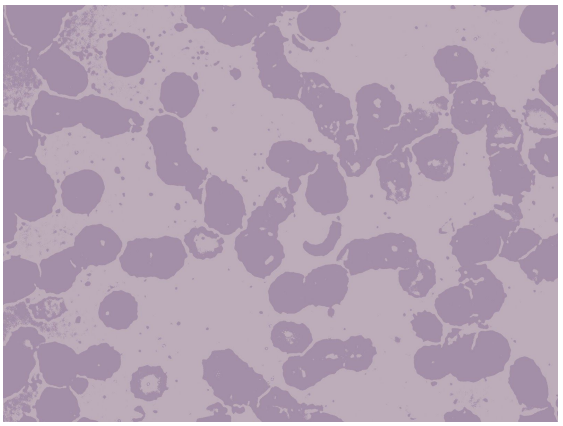
Plasmodium

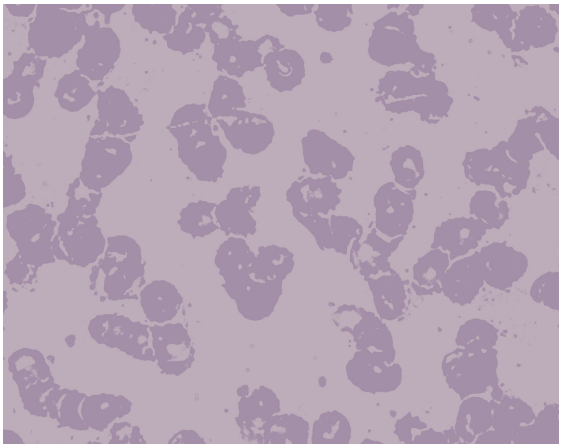
In some of the images; (d.), (g.), (h.), (j.) , the shape of the parasite is somewhat captured, but its color is not distinct from the other elements surrounding it.



(a.)

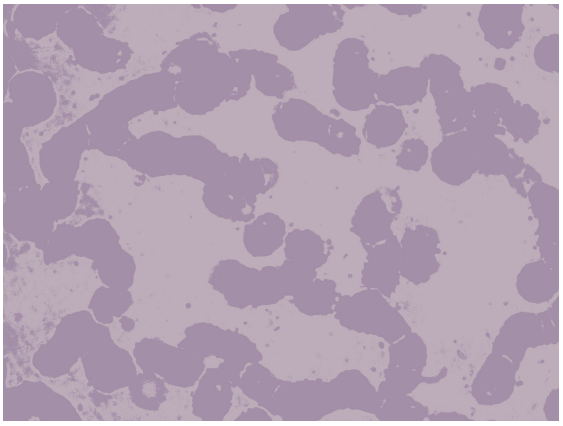


(d.)

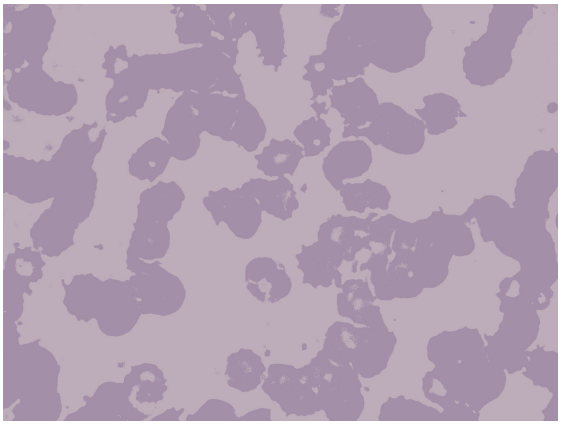


(b.)

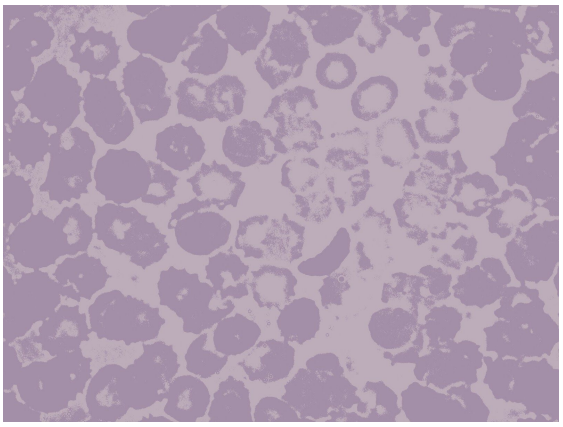
(e.)



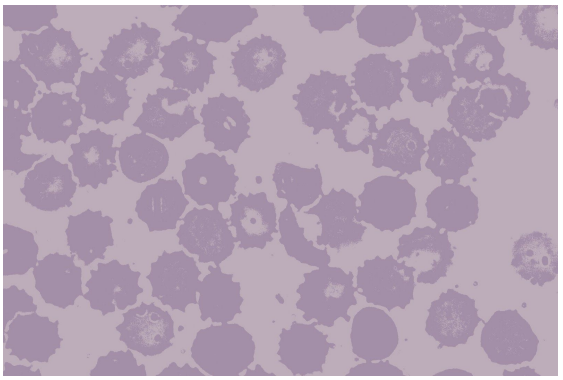
(c.)



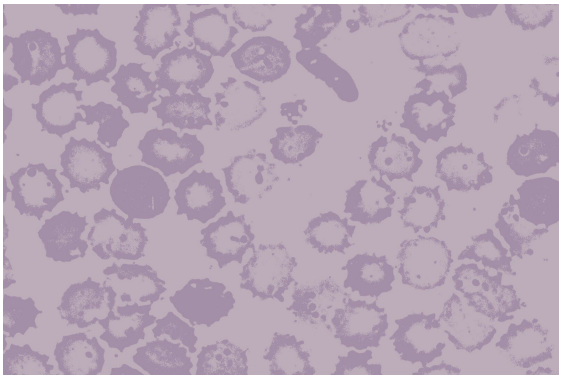
(f,)



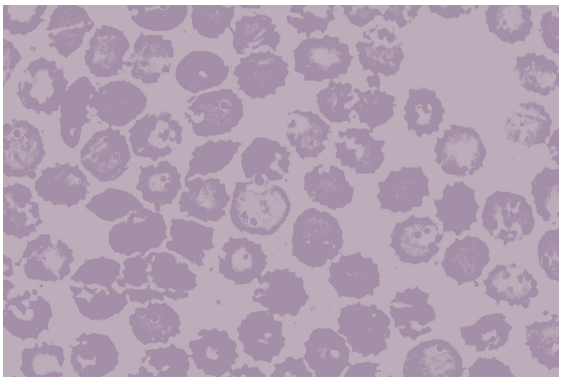
(g.)



(j.)



(h.)



(i.)

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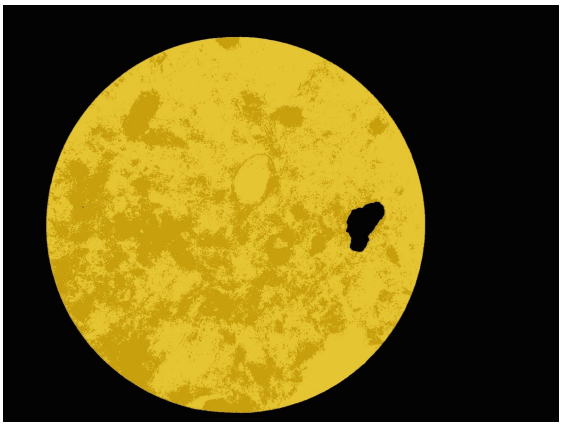
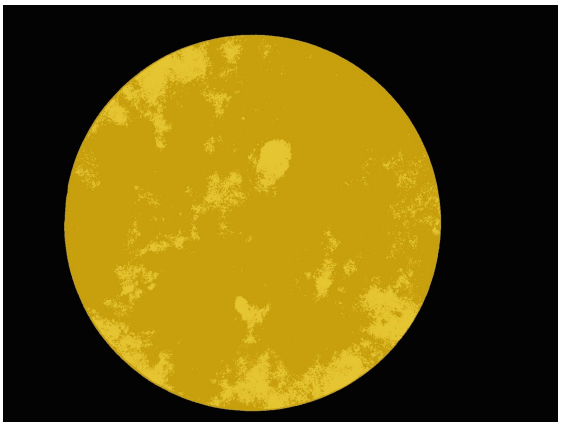
Schistosoma

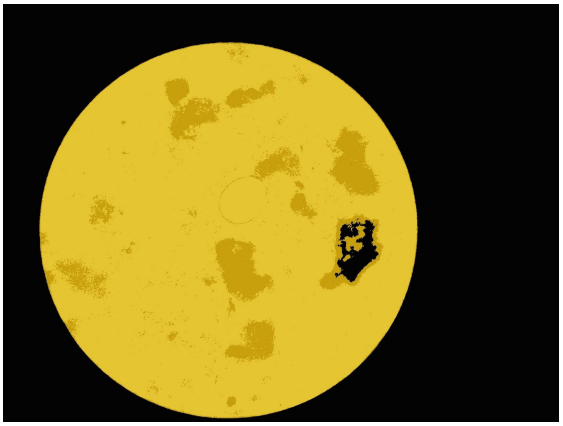
In some images, faint outlines of the shape of the parasite is captured. For instance, images (b.), (c.), (j.). In some, the shape can be somewhat traced, say in images (e.), (f.), (g.), and (j.)



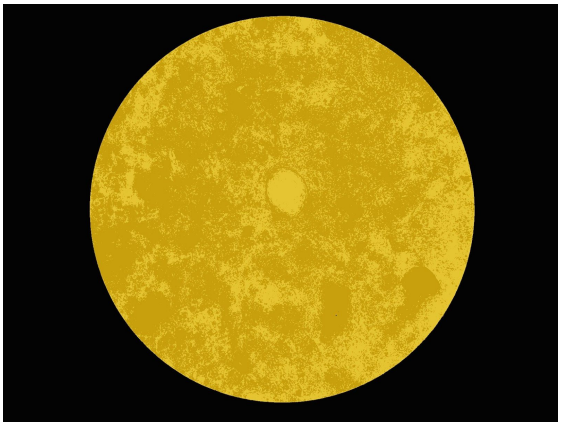
(a.)



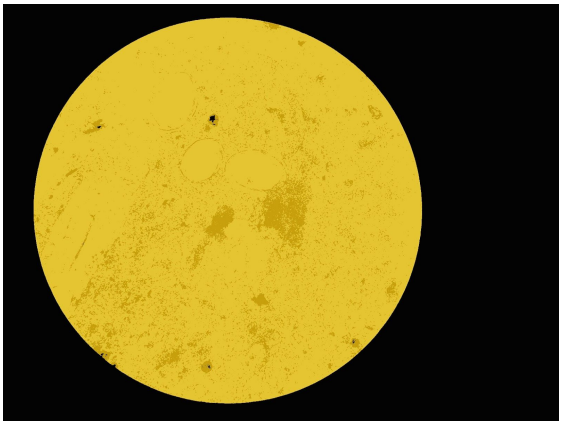
(d.)



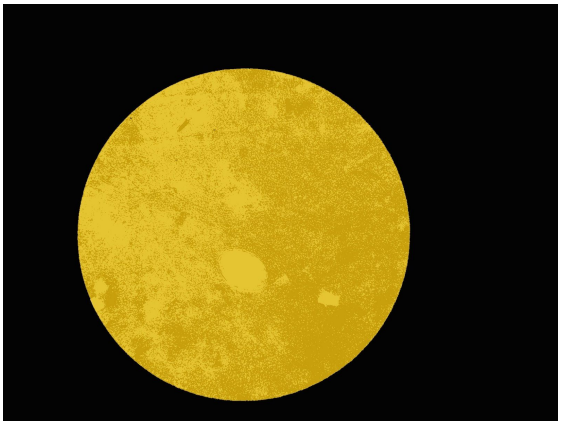
(b.)



(e.)



(c.)



(f.)

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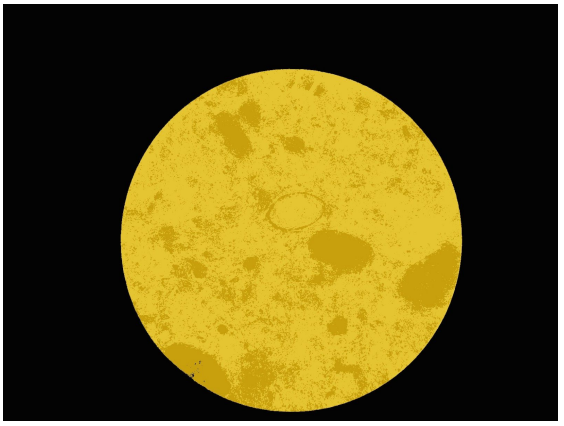
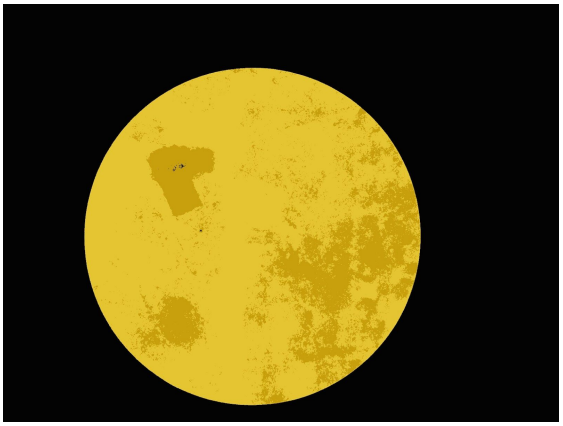
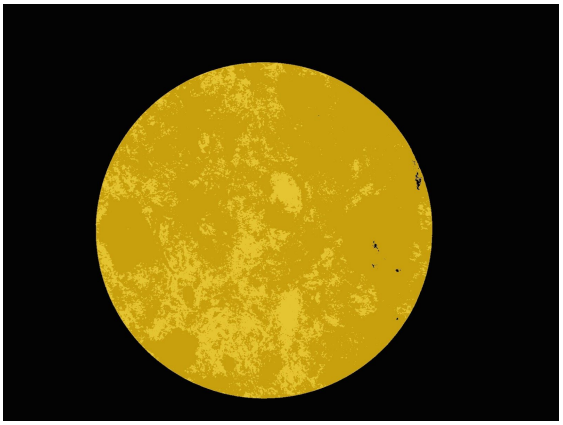


(j.)

(g.)



(h.)



(g.)

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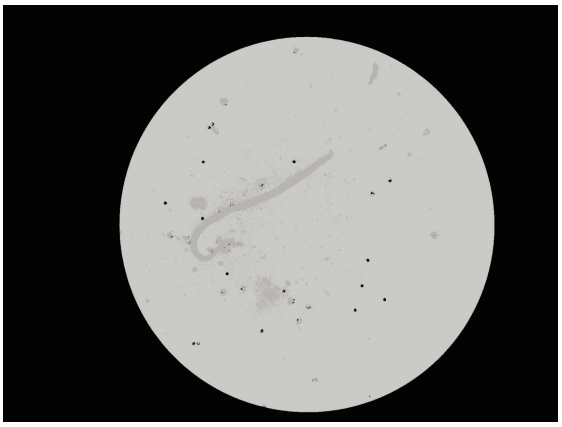
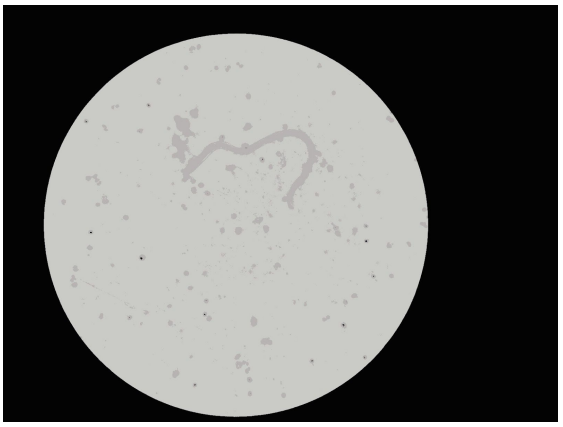
2. Running K-means with two manually selected centroids

There seems to be no significant difference between choosing two random centroids and manually choosing two centroids in all images of of the three specimens.

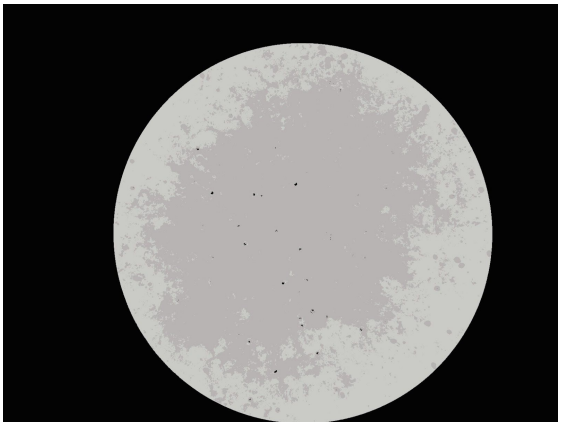
Filaria



(a.)

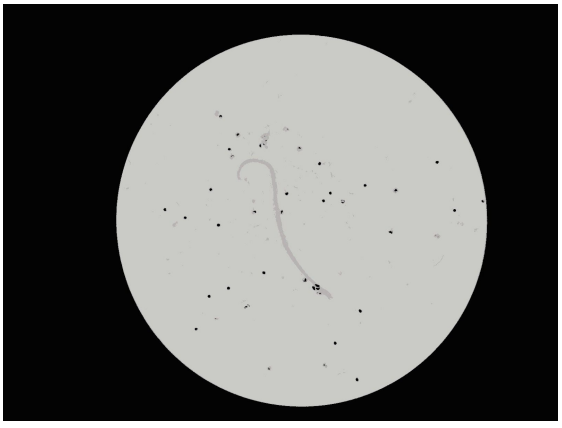


(d.)

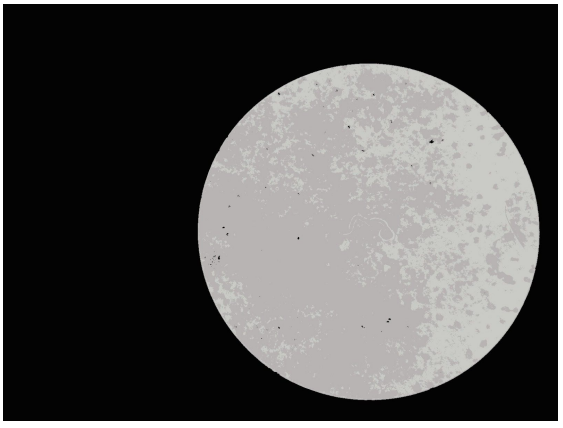


(b.)

(e.)

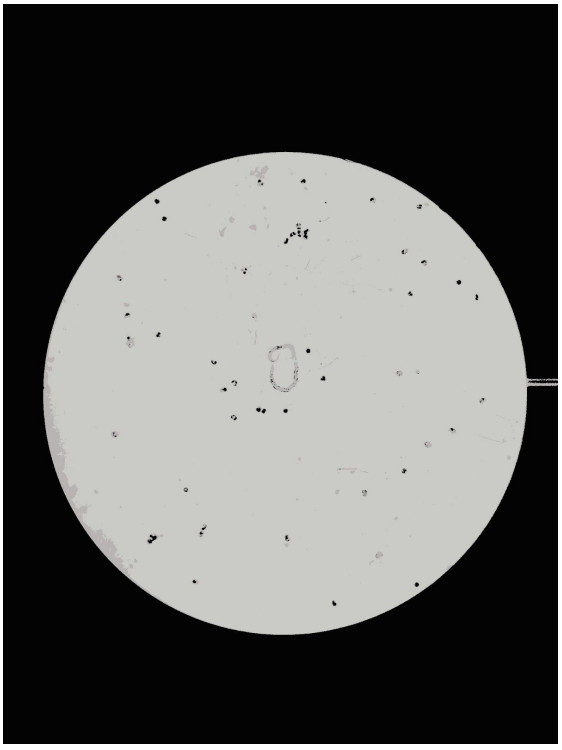


(c.)

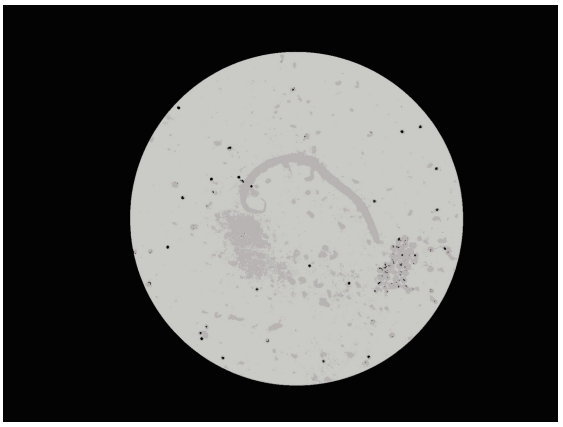


(f.)

(g.)



(h.)



(i.)

(j.)

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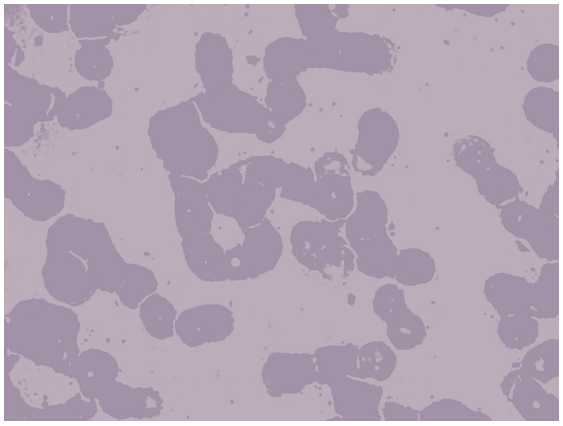
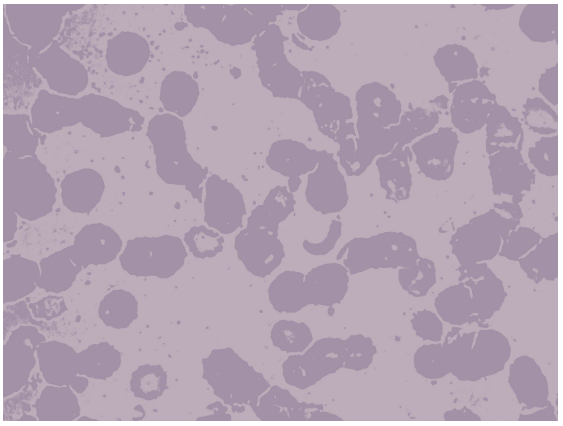
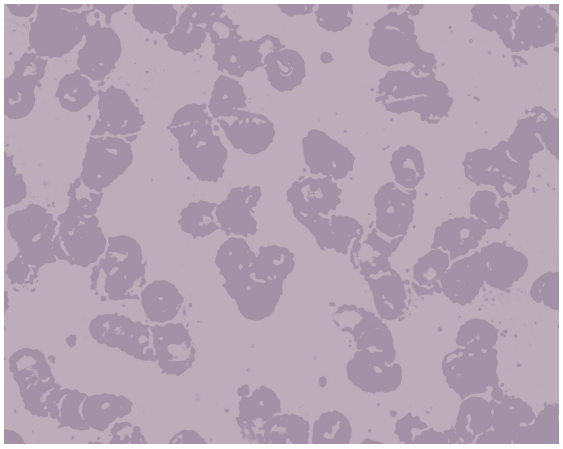
Plasmodium



(a.)

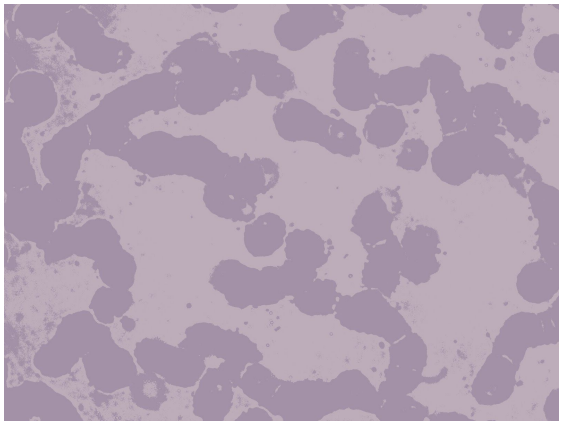


(d.)

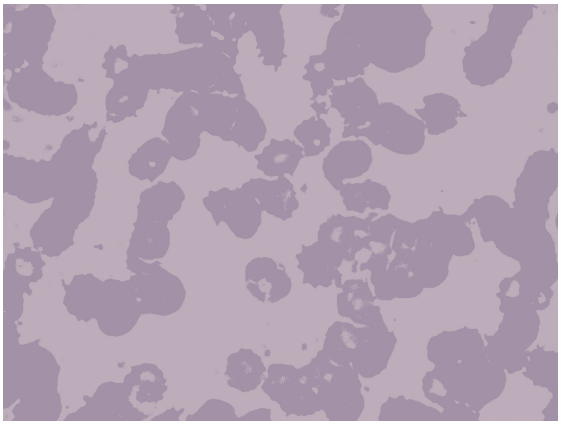


(b.)

(e.)



(c.)



(f.)

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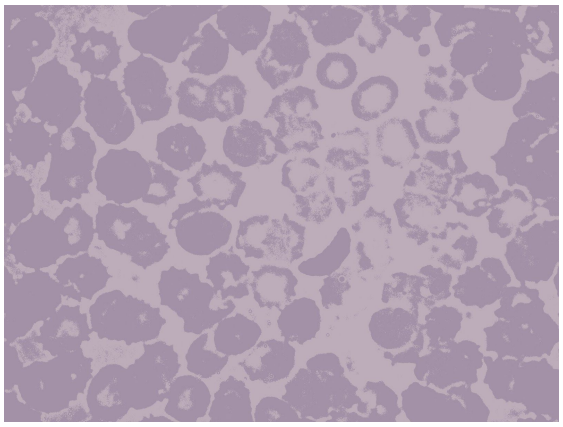
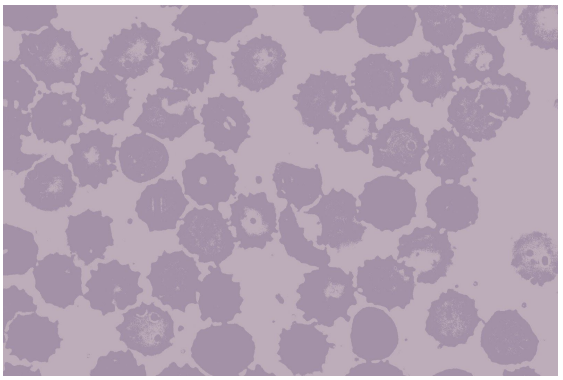
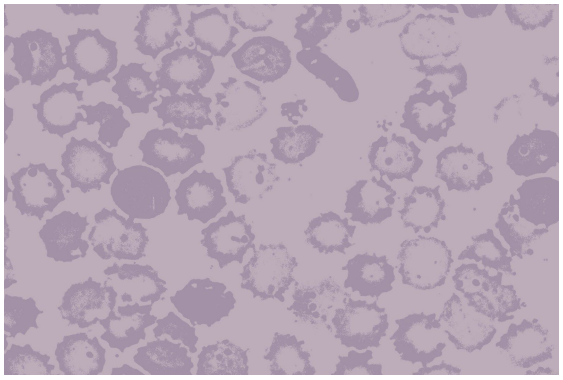


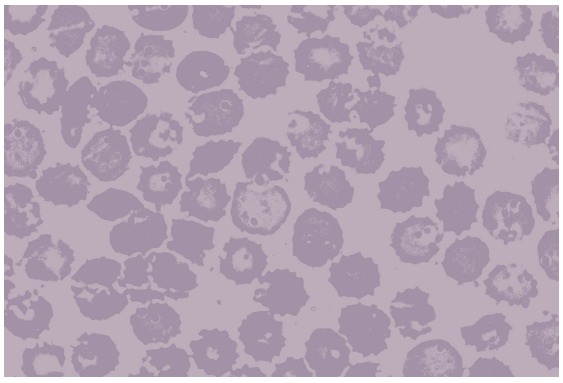
(g.)



(j.)



(h.)



(i.)

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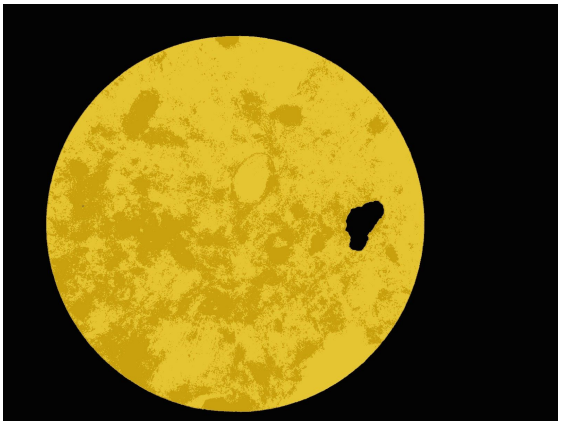
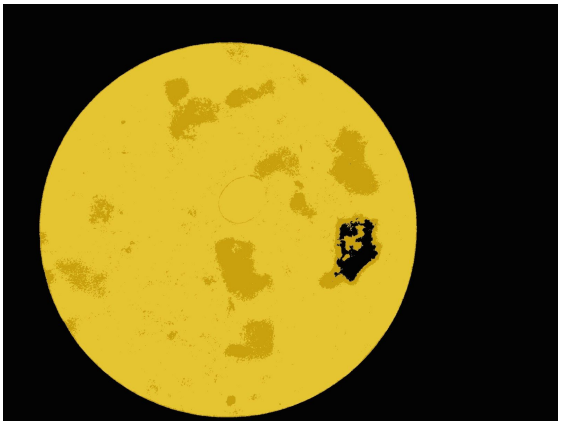
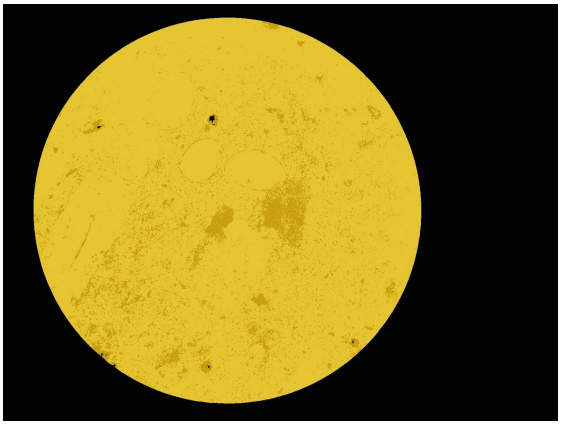
Schistosoma



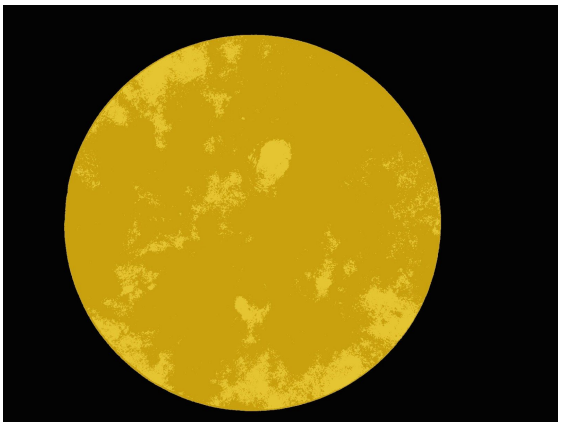
(a.)



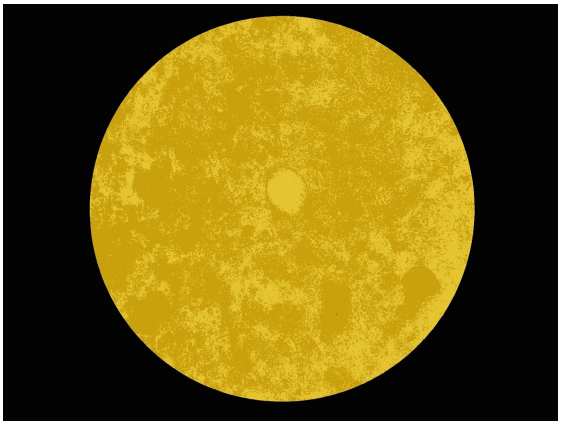
(b.)



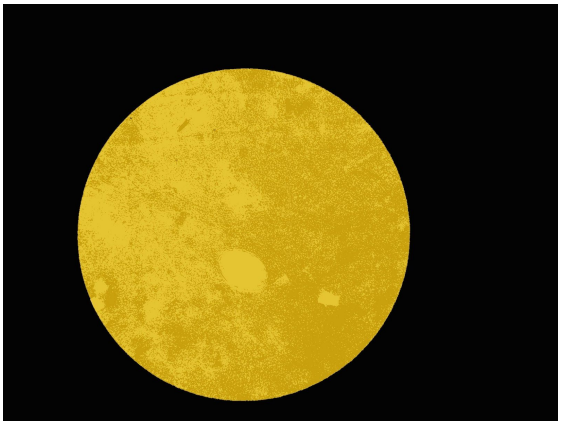
(c.)



(d.)



(e.)



(f.)

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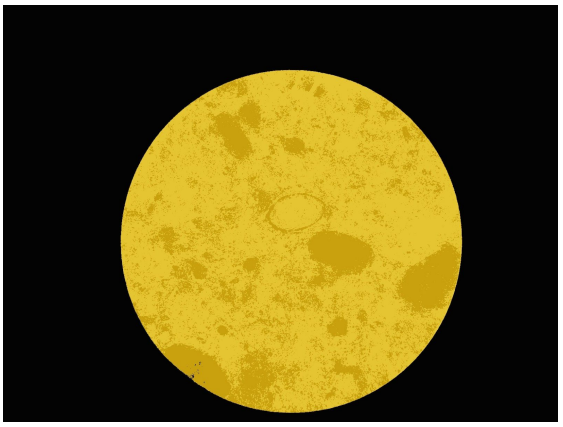
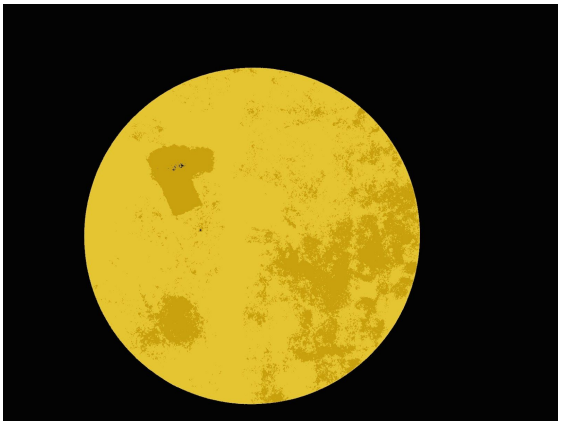
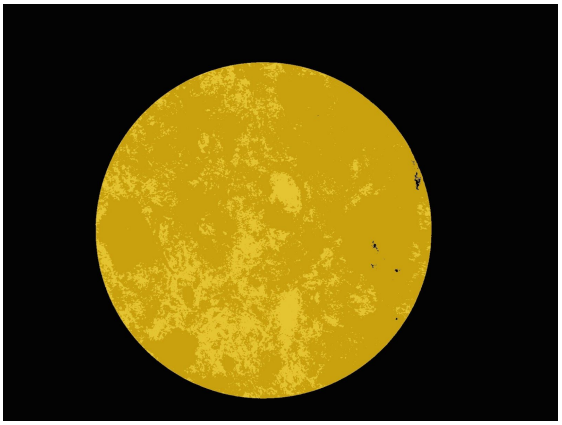
(g.)



(j.)



(h.)



(i.)

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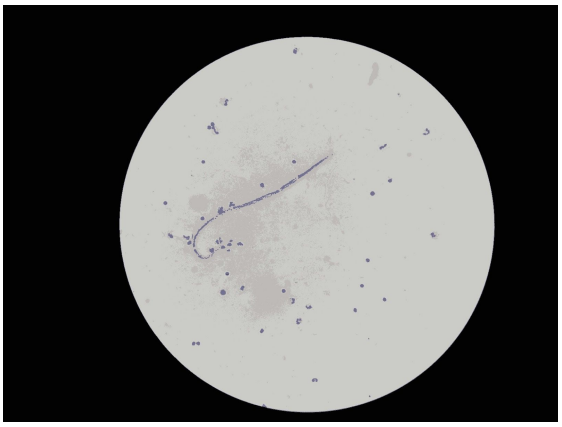
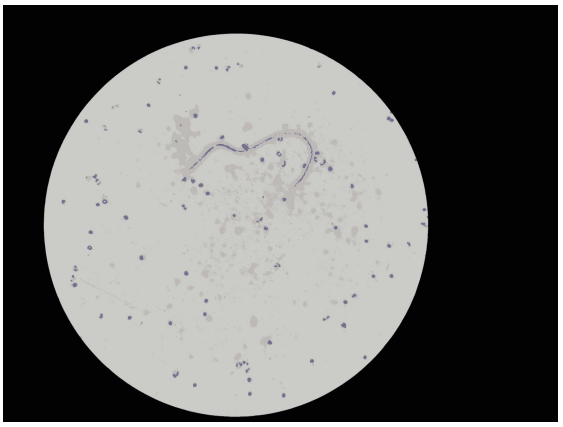
3. Running K-means with more than two centroids

Filaria

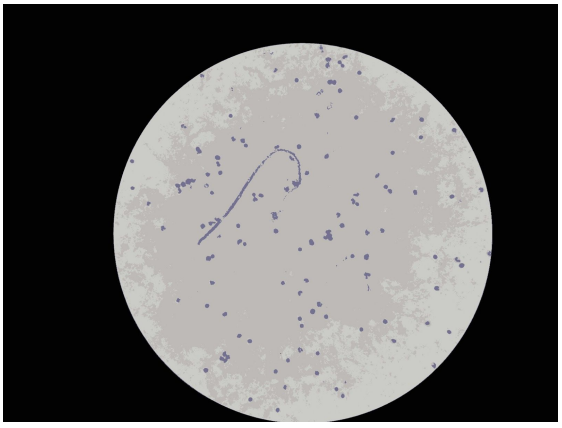
Compared to using just two centroids, the parasite is now more distinct and can be easily identified. Especially in images (a.), (b.), (c.), (d.), (h.), and (i.), while in the other images, you can faintly see some parts of the parasite.



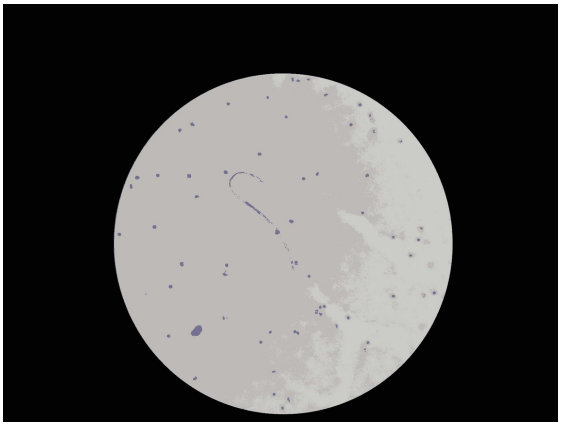
(a.)



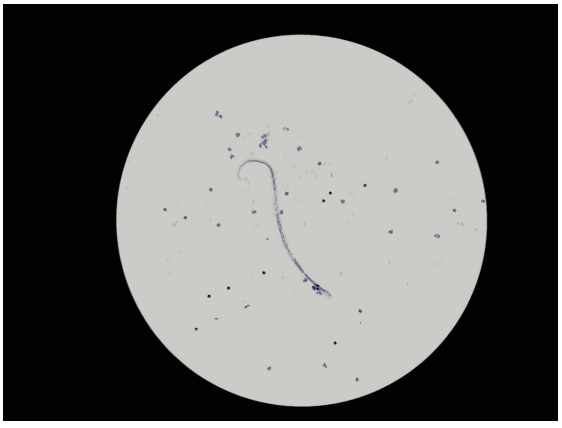
(d.)



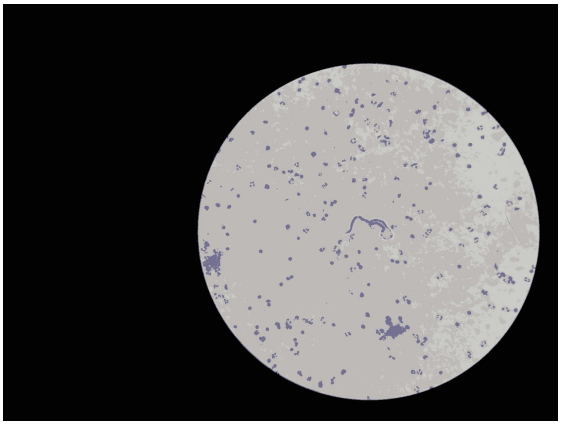
(b.)



(e.)



(c.)



(f.)

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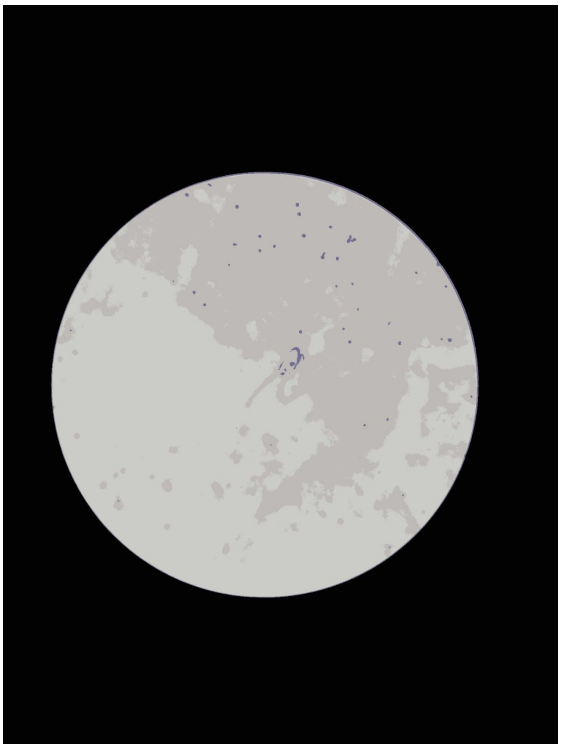
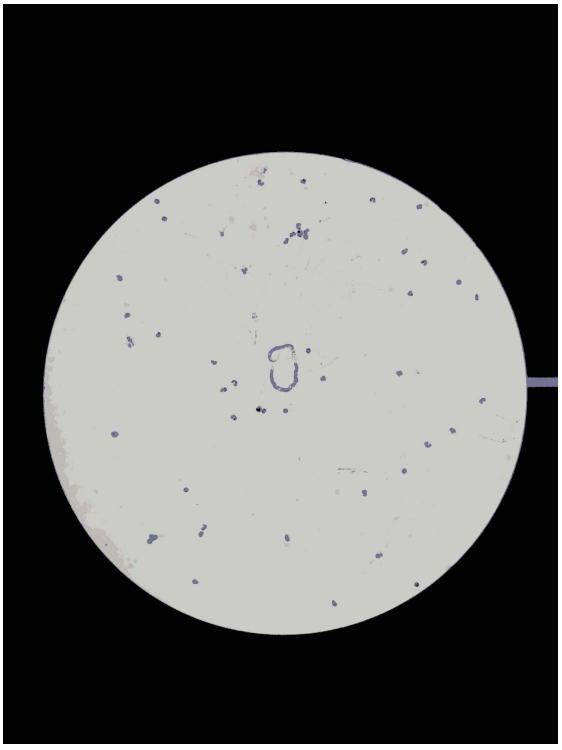
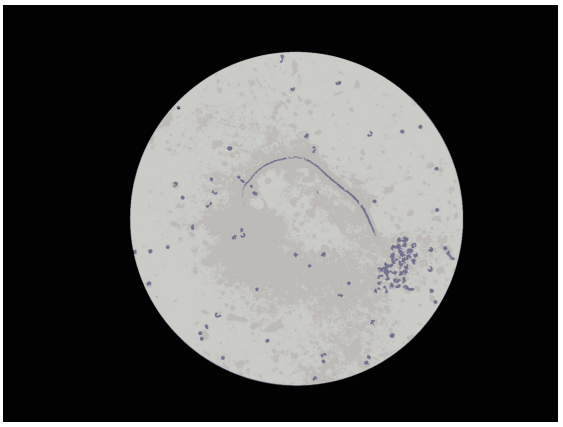


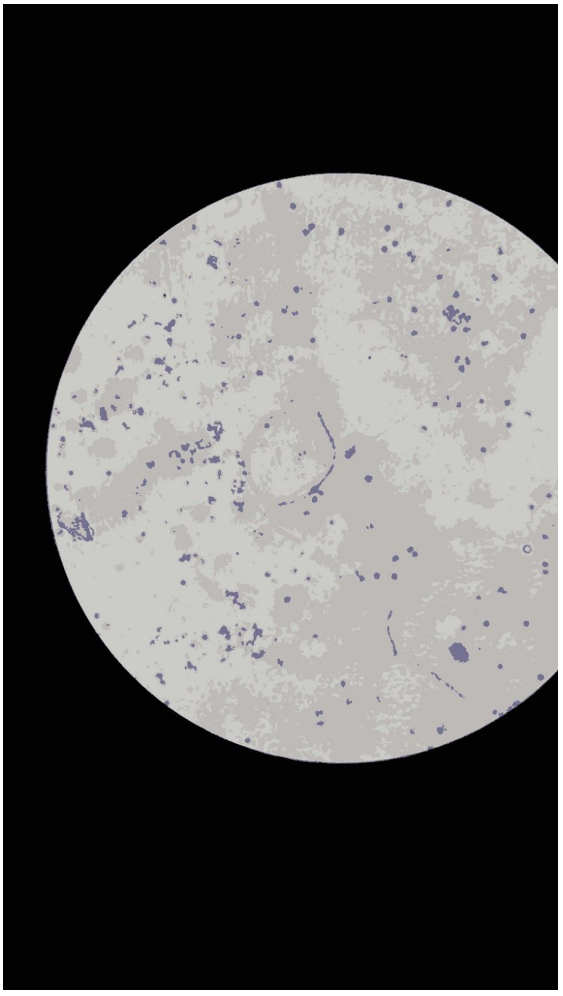
(g.)



(h.)



(i.)



(j.)

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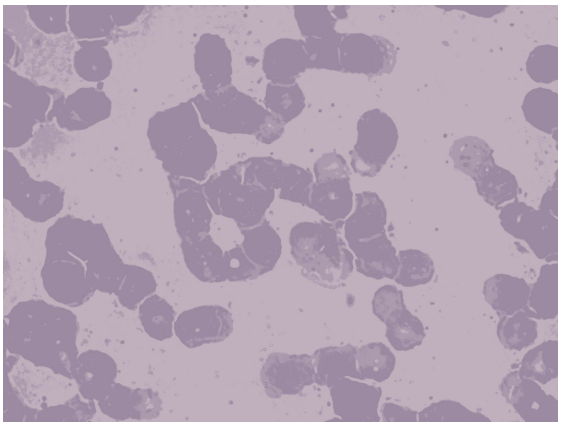
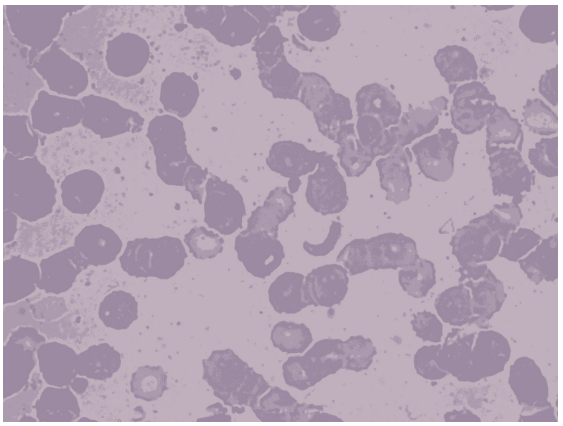
Plasmodium

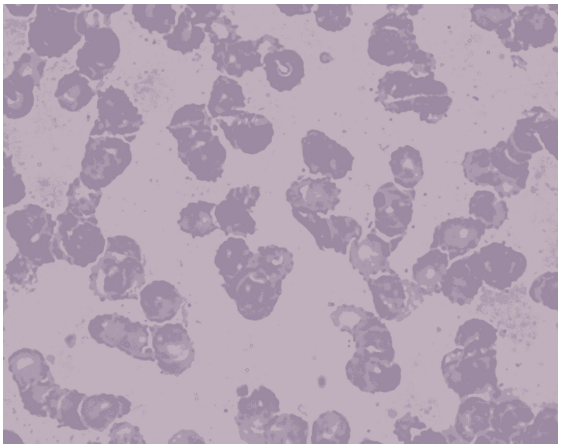
Even with three centroids, although the shape of the parasite can be distinguished in some of the images, it is still hard to tell distinguish the parasite from the rest in terms of its color.



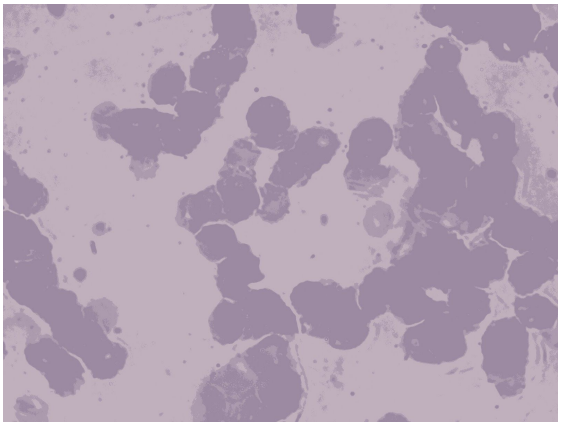
(a.)



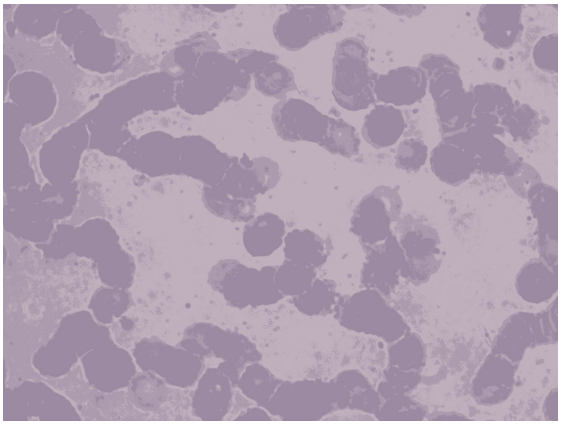
(d.)



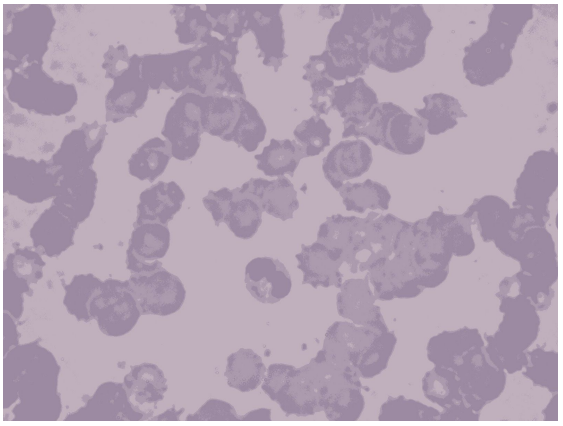
(b.)



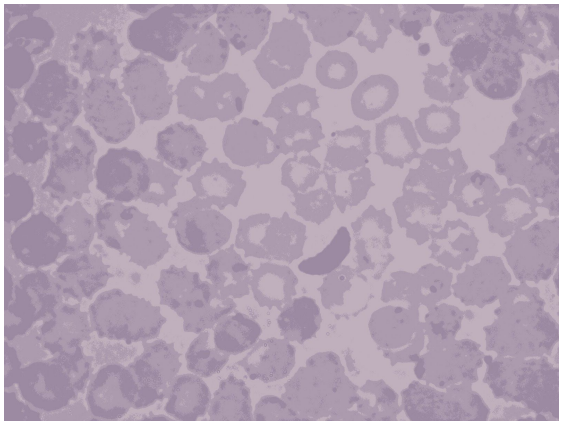
(e.)



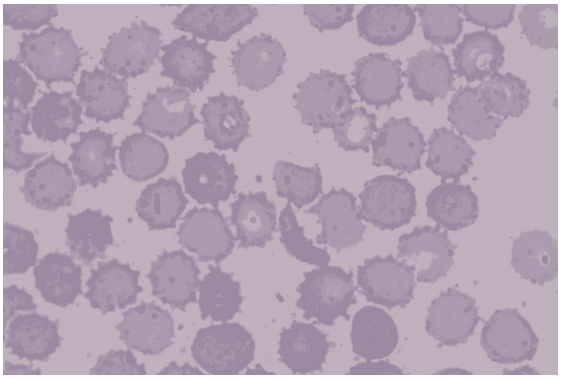
(c.)



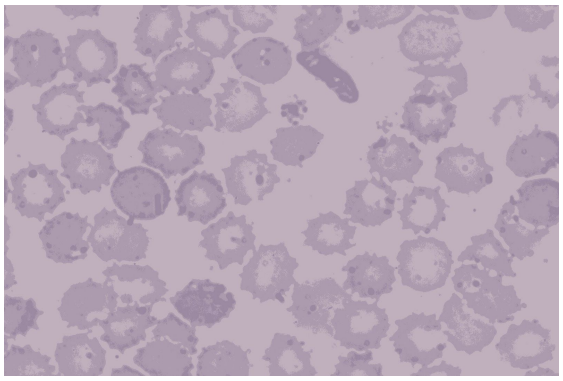
(f.)



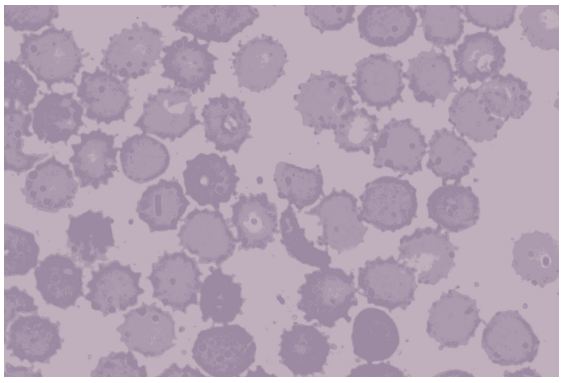
(g.)



(j.)



(h.)



(i.)

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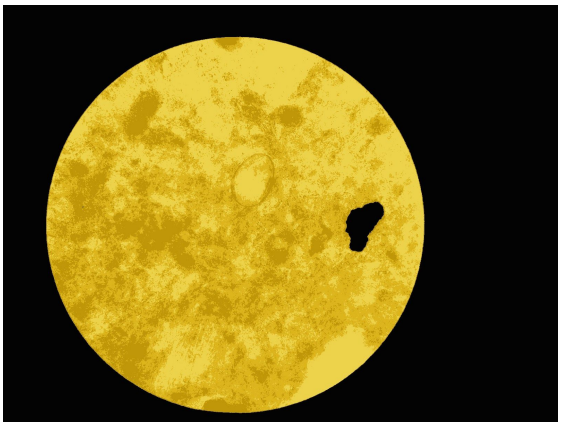
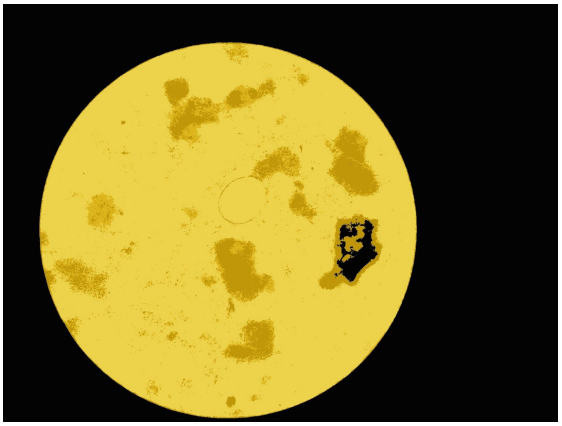
Schistosoma

Much like using two centroids, only in some images can the shape or outline of the shape of the parasite can be captured. In images (e.) and (f.), the parasite is somewhat distinguishable (the light yellowish spot)

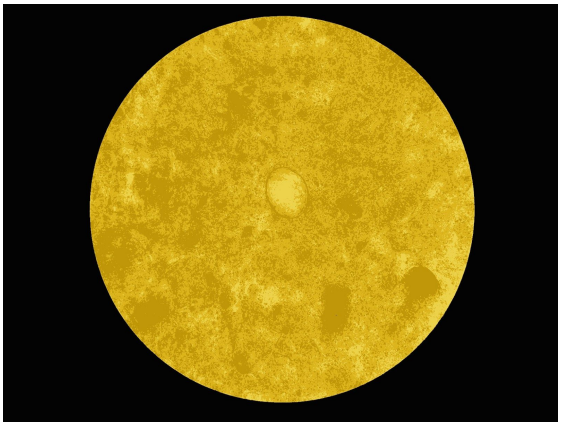


(a.)

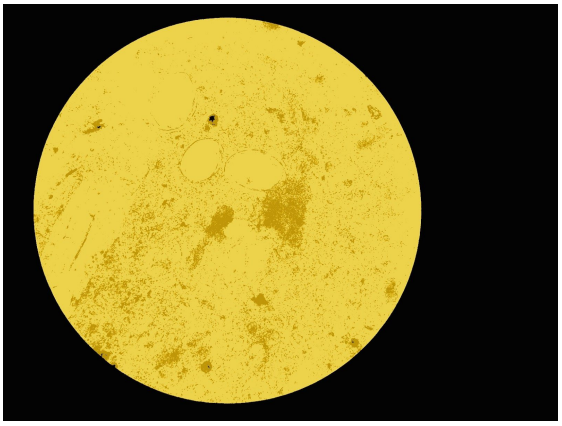
(d.)



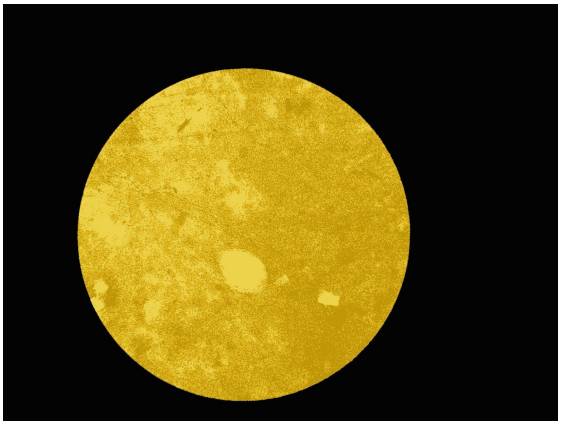
(b.)



(e.)



(c.)



(f.)

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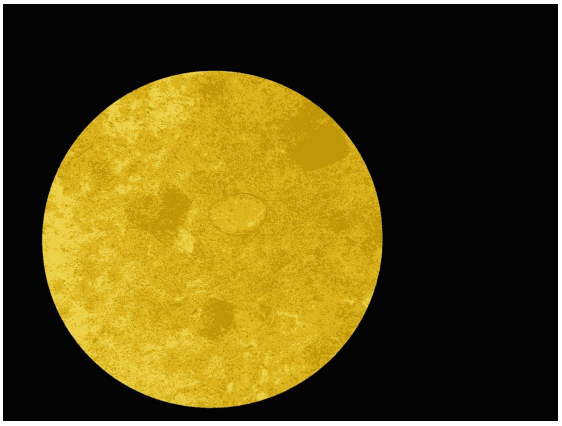
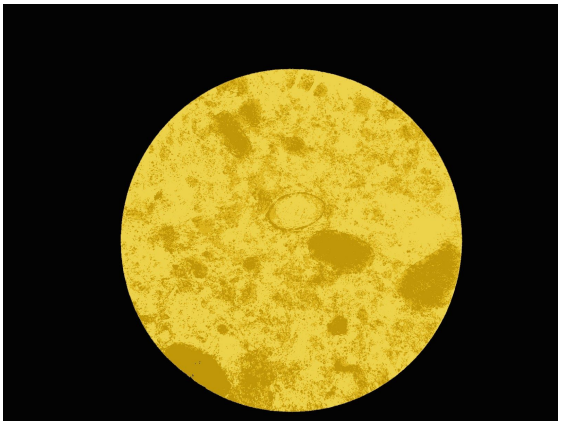
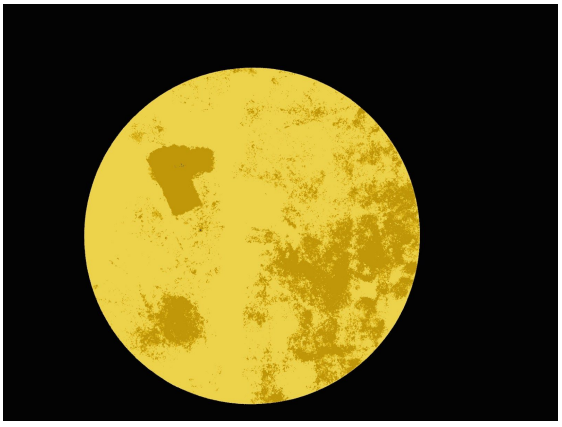


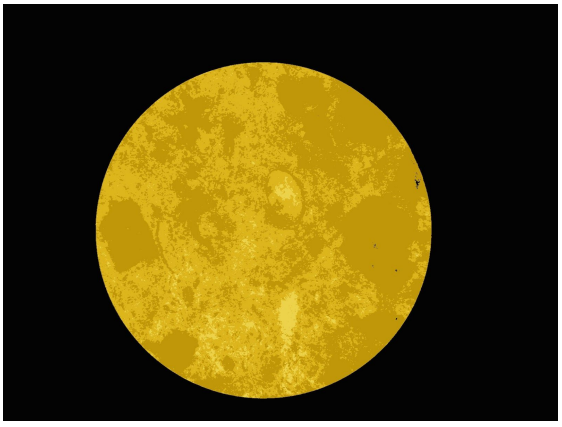
(g.)



(j.)



(h.)



(i.)

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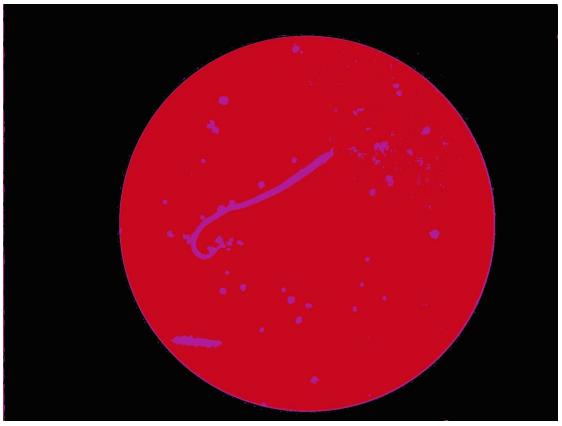
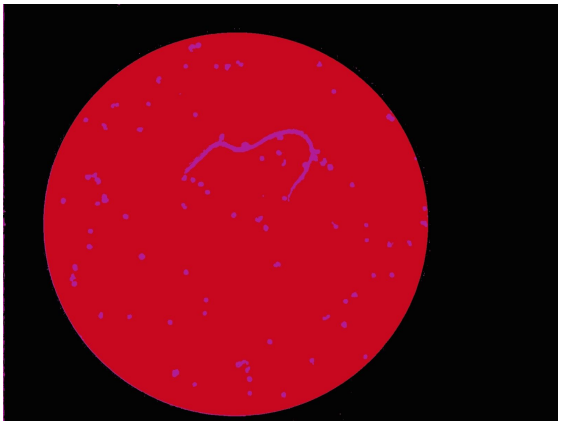
4. Changing Colorspaces

Filaria with HSV colorspace

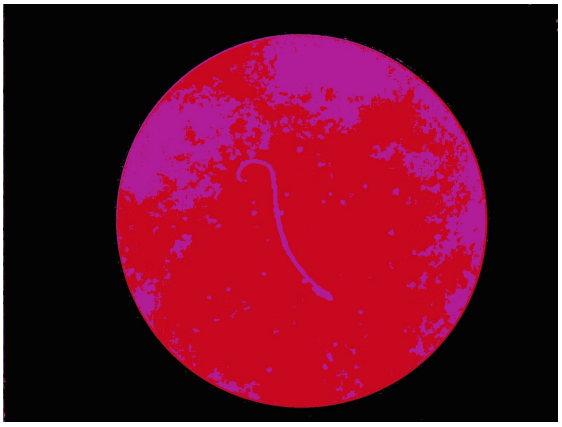
In HSV colorspace, the contrast between the parasite and the surrounding elements are high that the parasite is distinguishable, except for images (f.) and (j.) where the parasite in (f.) is small and both ((f.) and (j.) parasites) are clustered with non-parasite parts that have close HSV values.



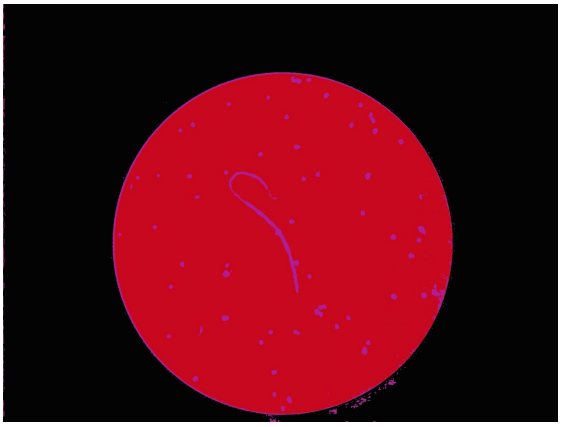
(a.)



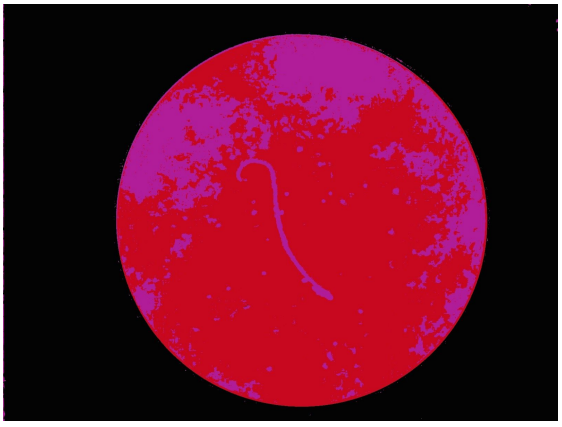
(d.)



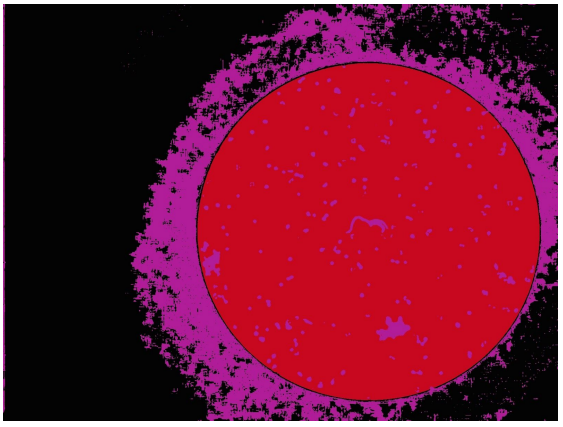
(b.)



(e.)



(c.)



(f.)

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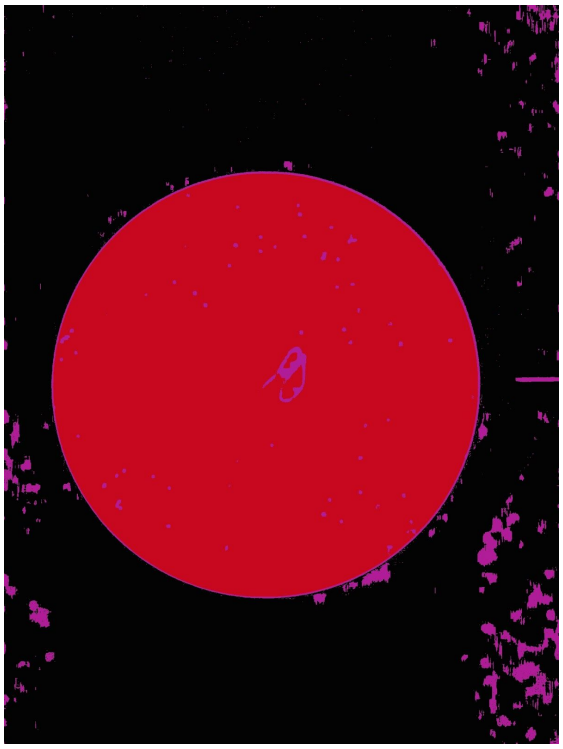
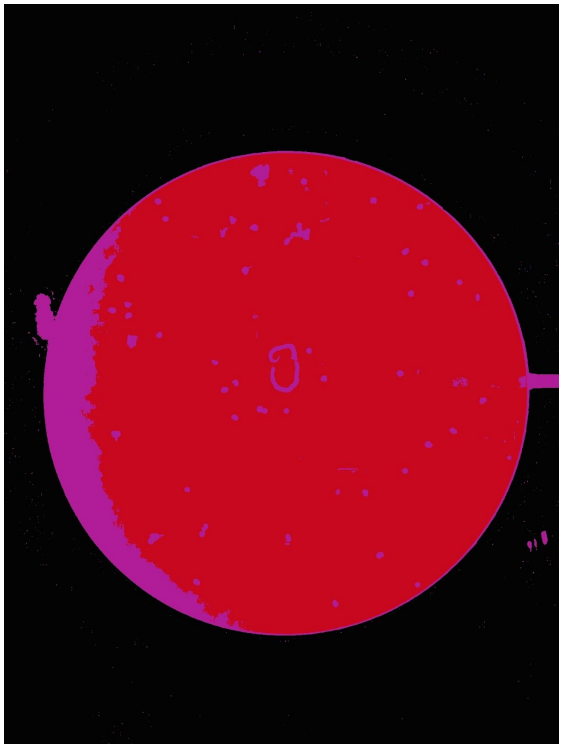
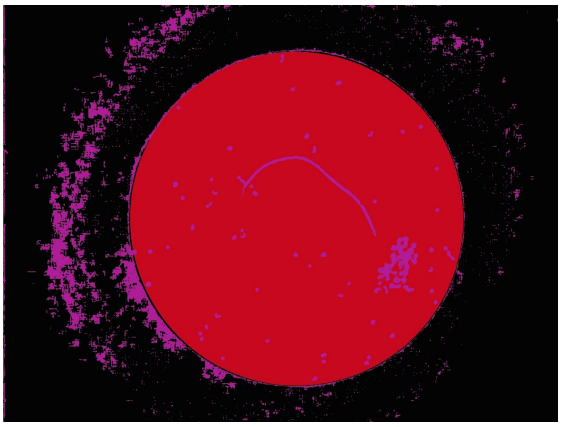


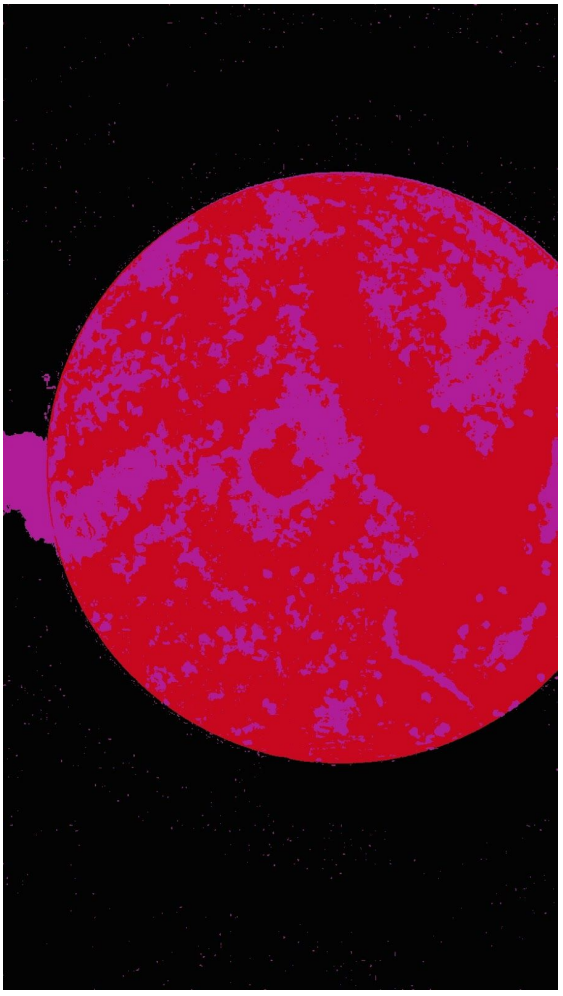
(g.)



(h.)



(i.)



(j.)

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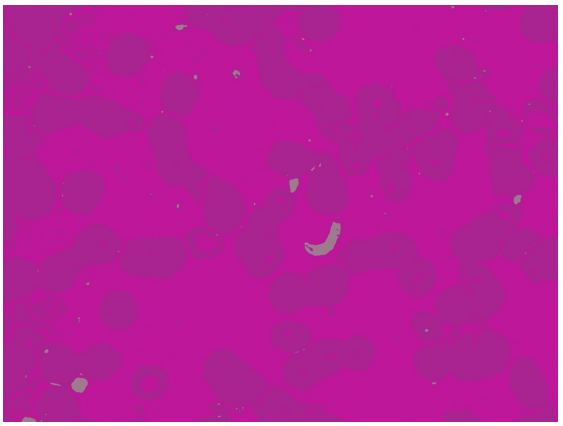
Plasmodium in HSV colorspace

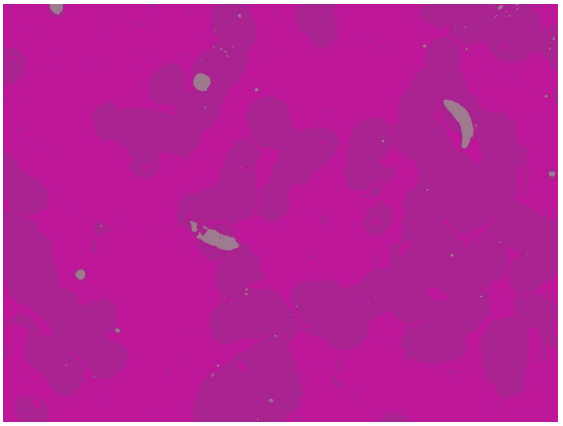
Using the HSV colorspace the parasites now have their own distinct color, making them visible compared to using the BGR colorspace.

(a.)



(d.)

(b.)

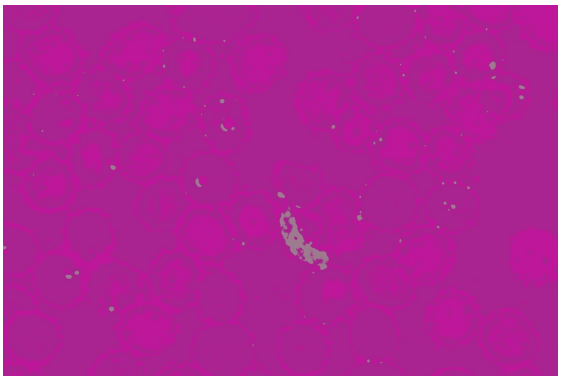


(e.)

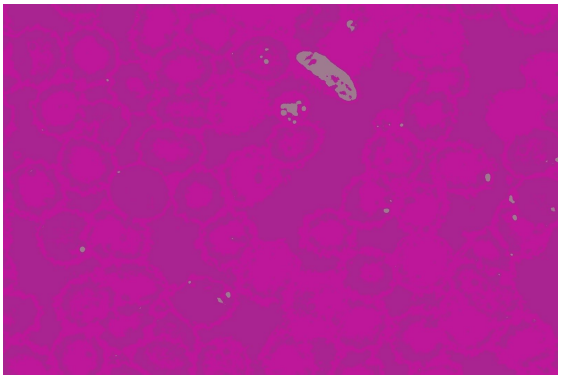
(c.)

(f.)

(g.)



(j.)



(h.)

(i.)

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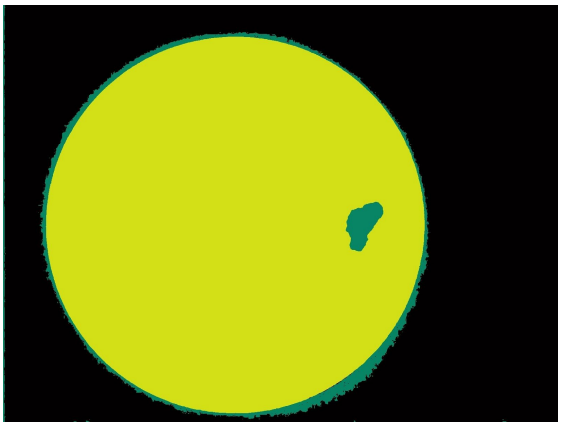
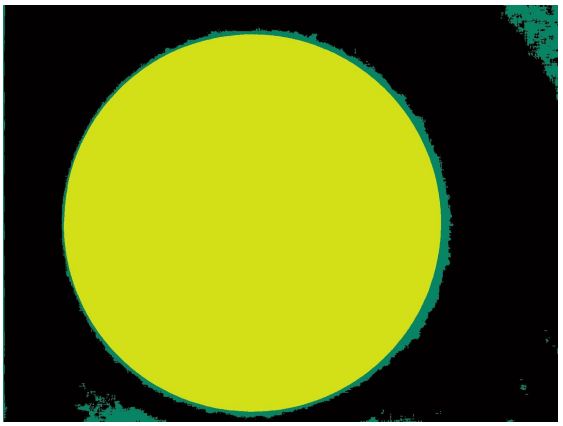
Schistosoma in HSV colorspace

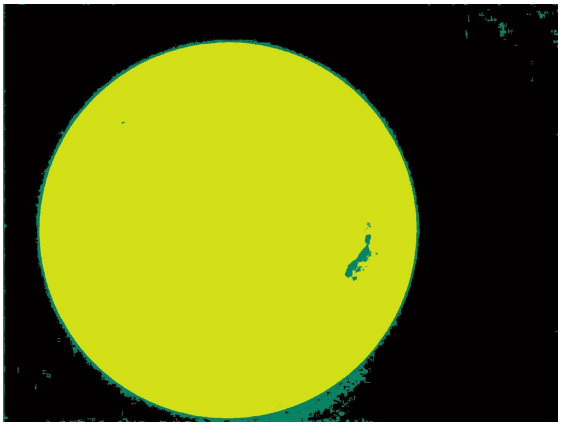
Using the HSV colorspace to segment the image, most of the image show no distinct outline or shape of the parasite. This is probably due to the nature of the image wherein the colors are all shades of yellow.



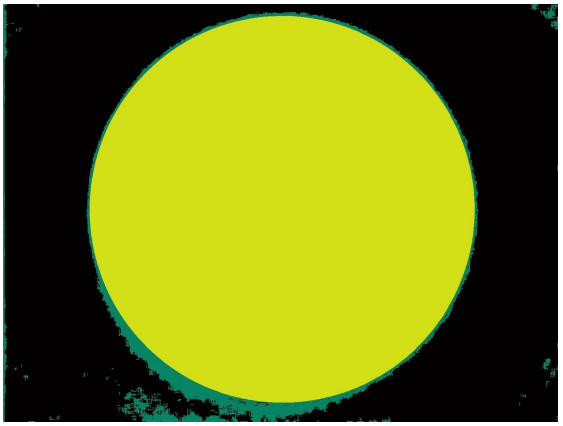
(a.)



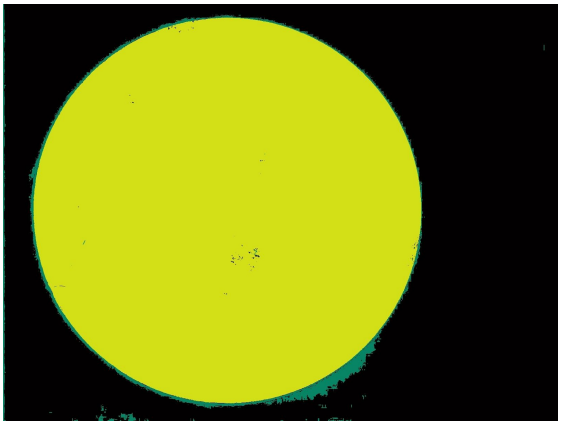
(d.)



(b.)

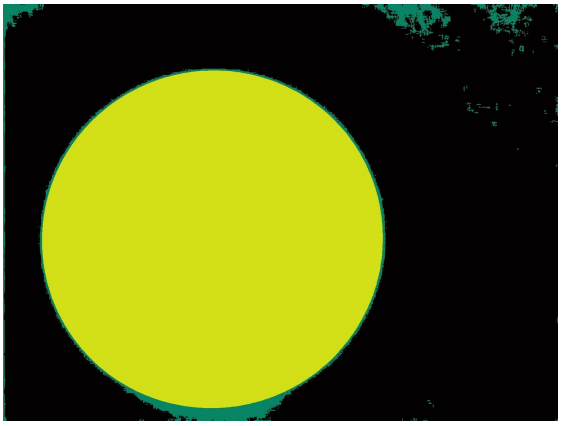


(e.)

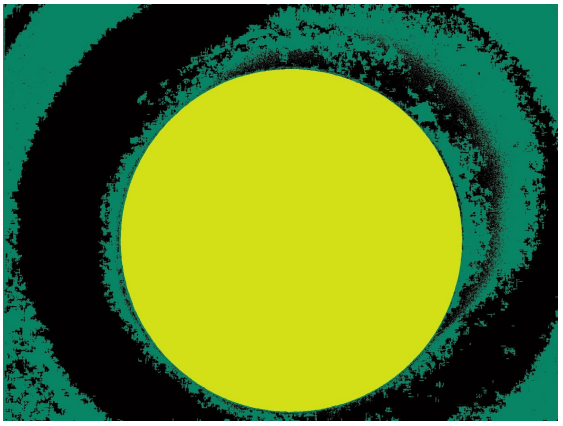


(c.)

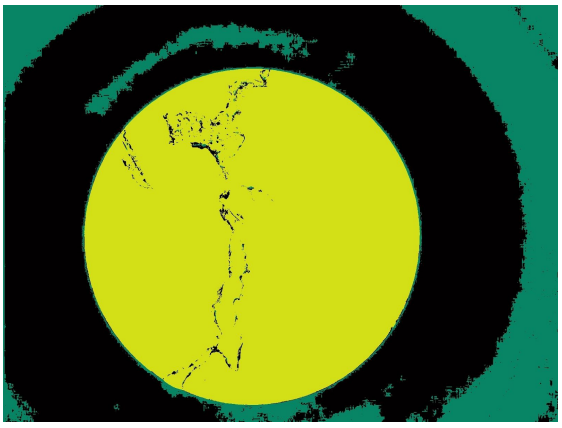
(f.)



(g.)



(j.)



(h.)

(i.)

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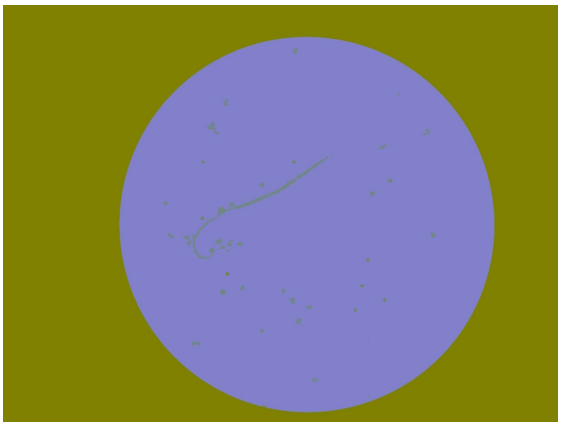
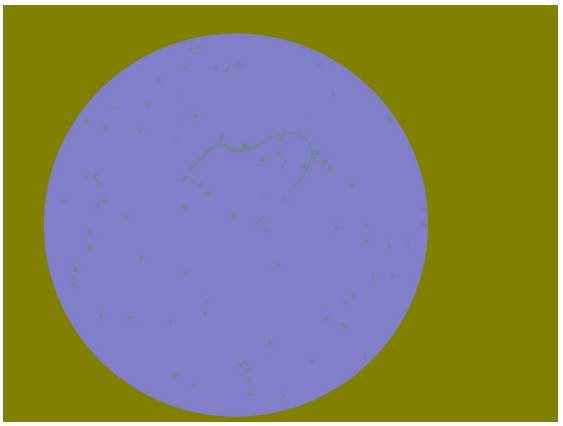
Filaria in CIEL*a*b* colorspace

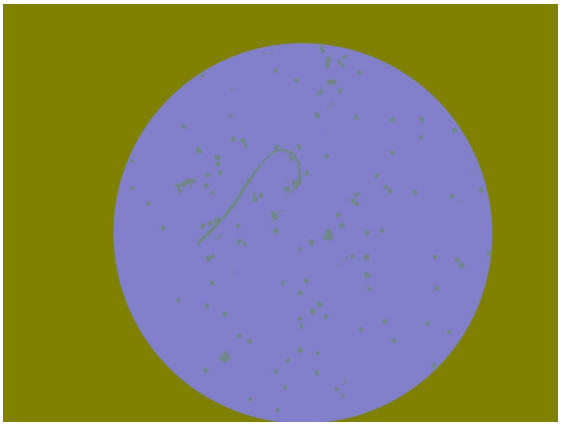
Much like using HSV colorspace, the parasite is now distinguishable. Here, (j.) where the parasite was not that distinguishable using HSV, is now much more visible.



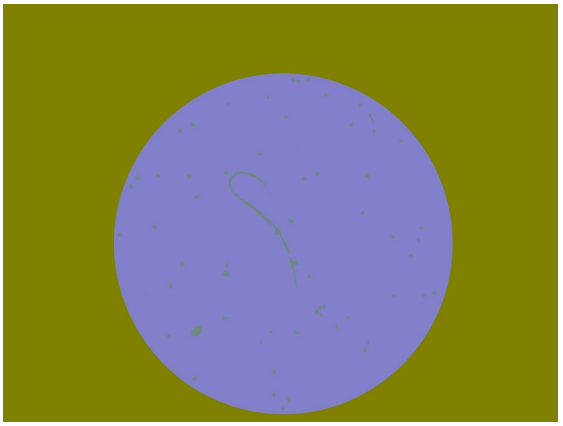
(a.)



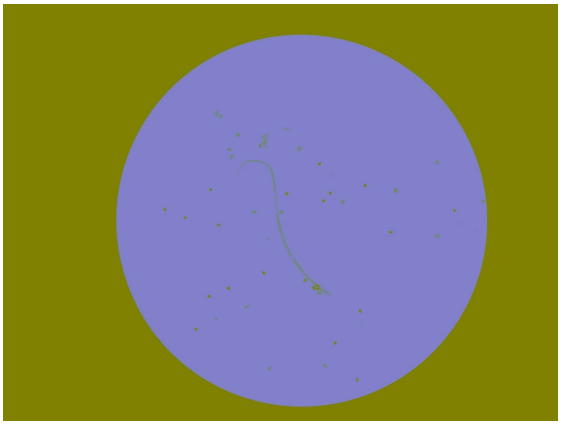
(d.)



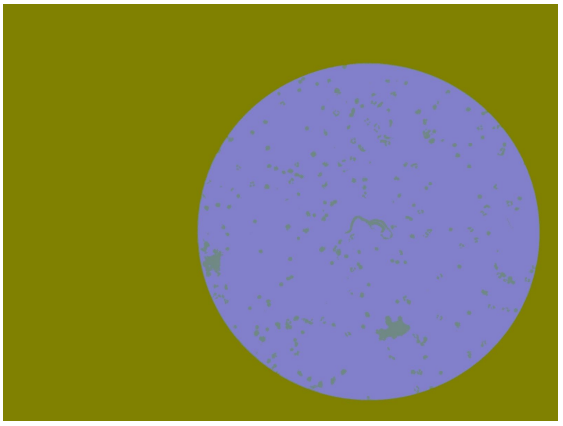
(b.)



(e.)



(c.)



(f.)

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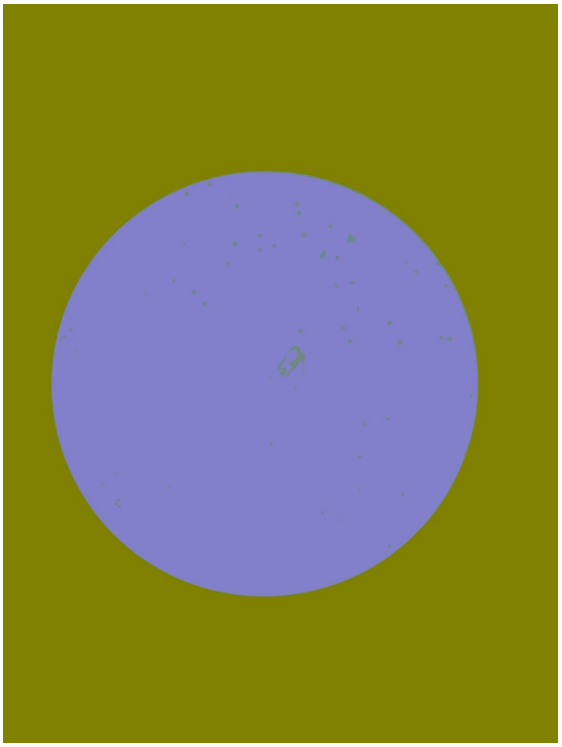
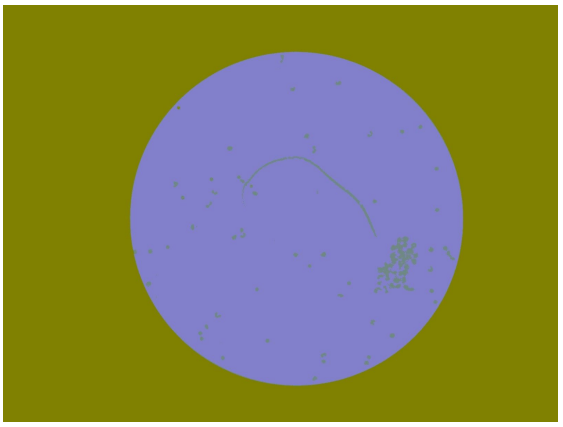
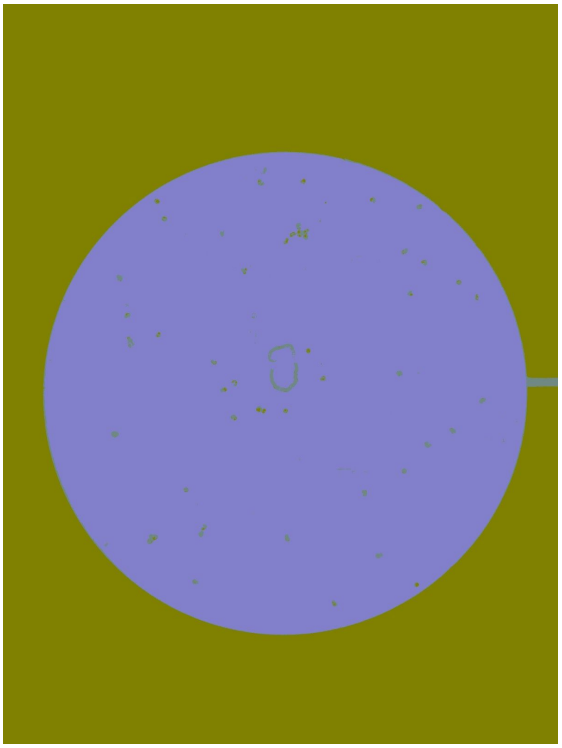


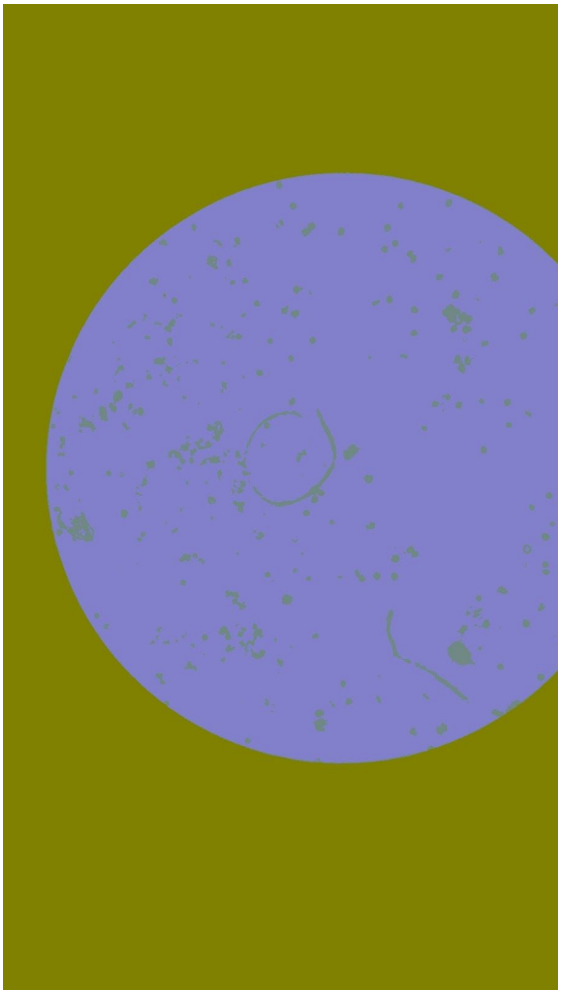
(g.)



(i.)



(h.)



(j.)

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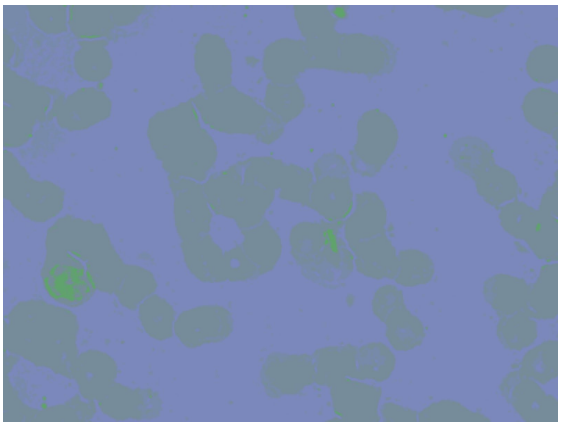
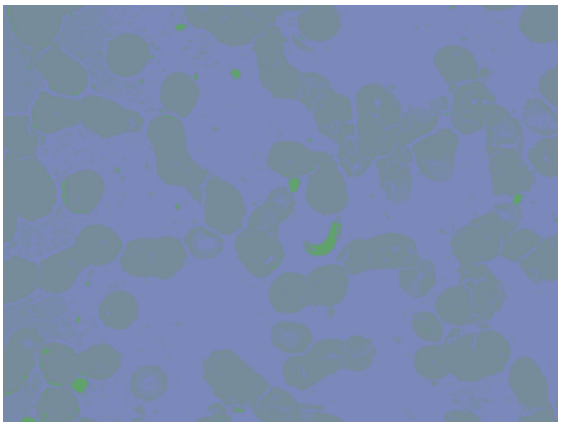
Plasmodium in CIEL*a*b* colorspace

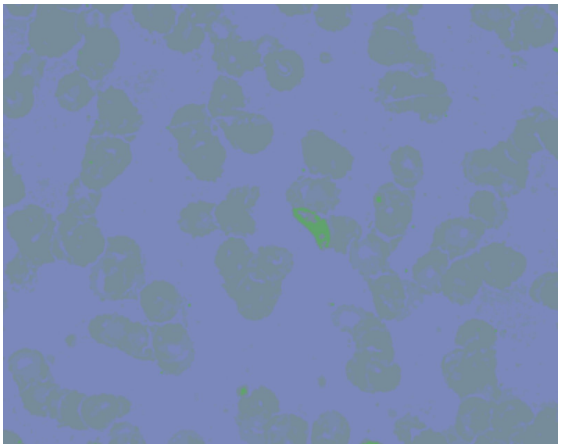
Segmenting the image using CIEL*a*b* here somewhat produces the same result. The parasites are much more visible compared to using BGR channels.



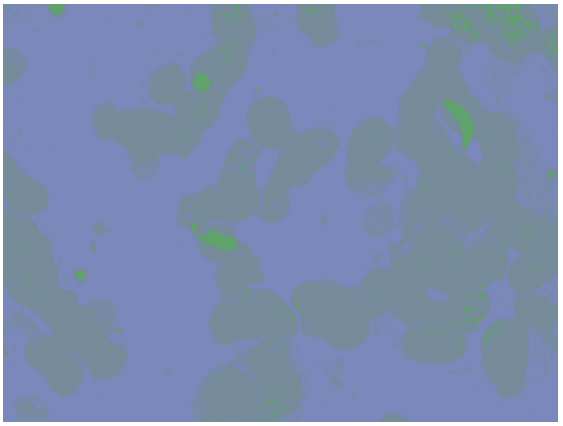
1



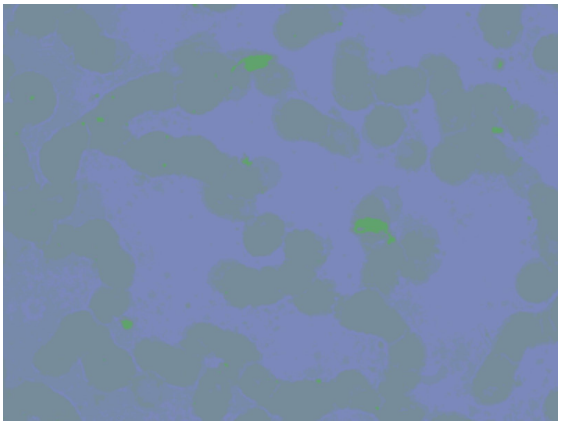
4



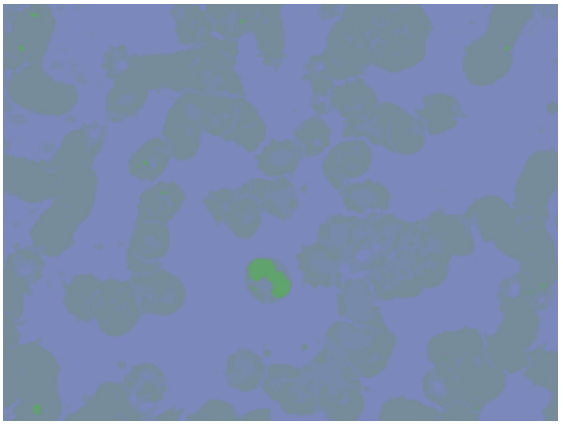
2



5



3



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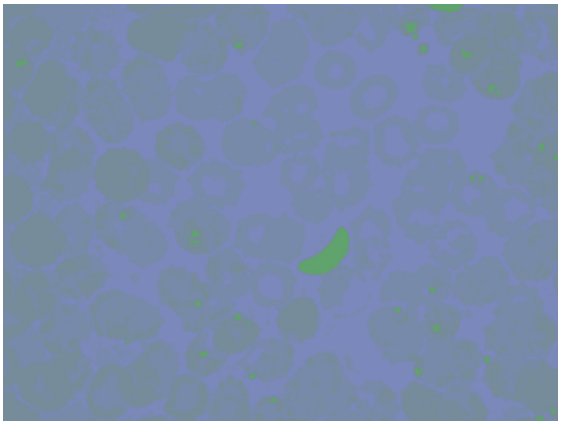
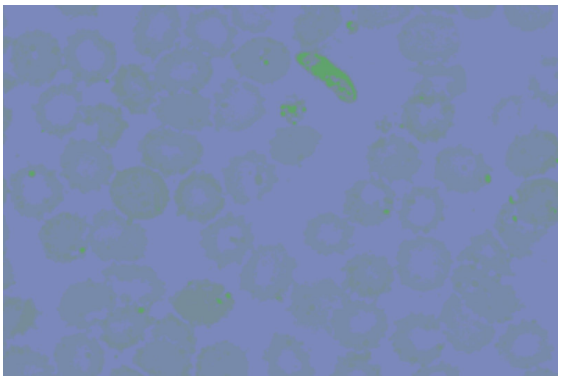
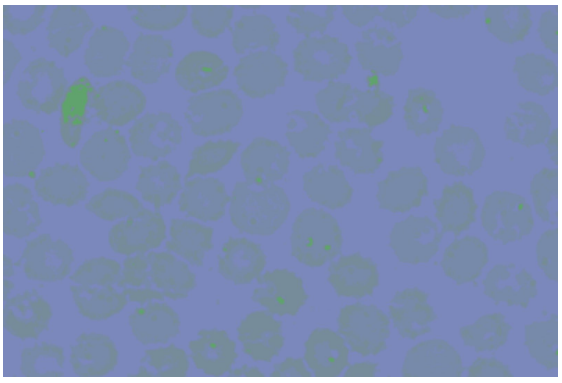


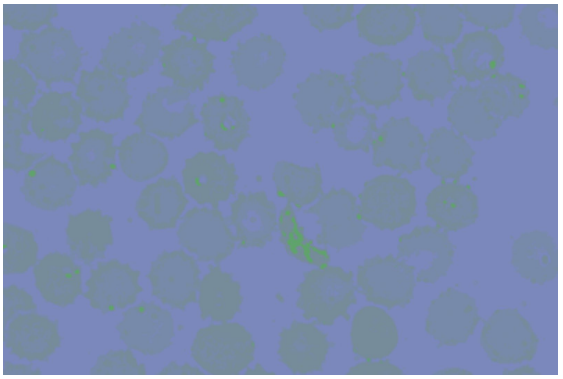
7



8



9



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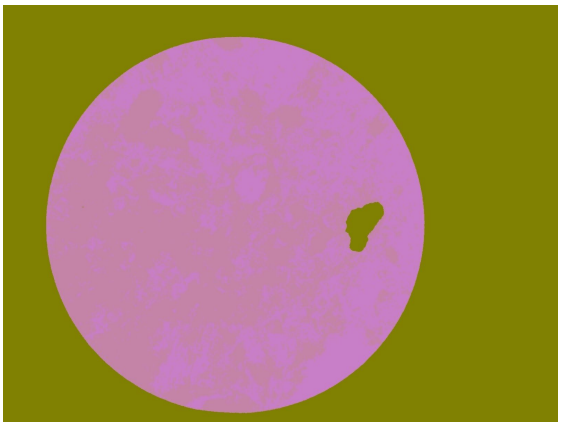
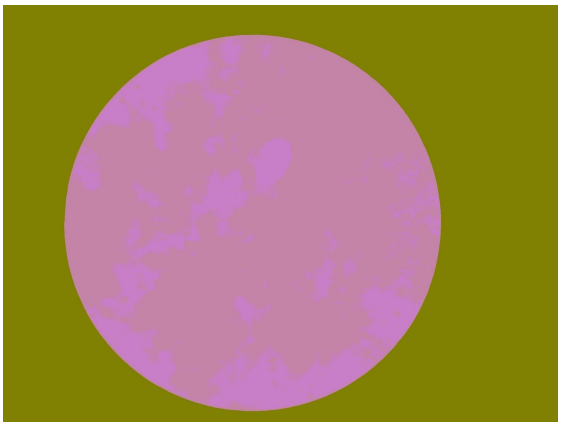
Schistosoma in CIEL*a*b* colorspace

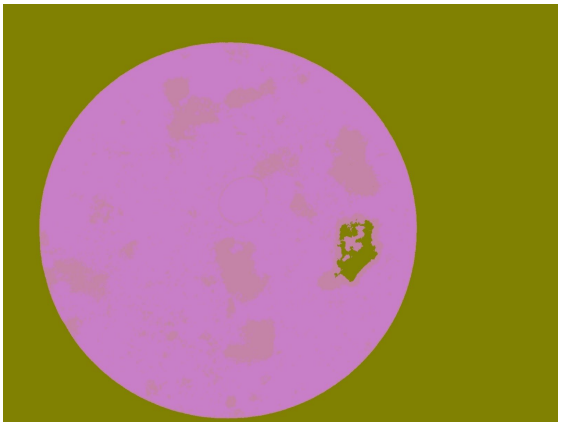
Much like using HSV, it is also hard to distinguish the parasite in the following images, which may also be the case of the image having mostly shades of yellow.



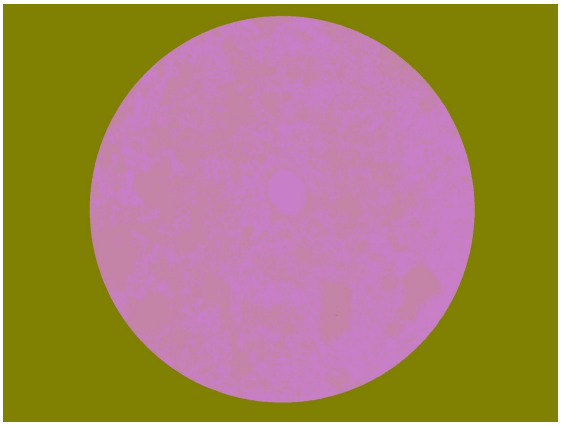
1



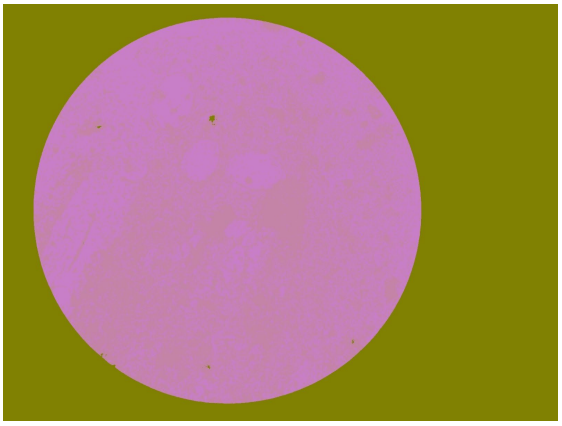
4



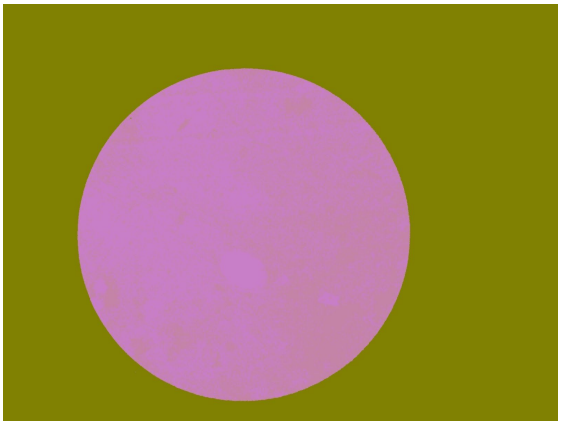
2



5



3



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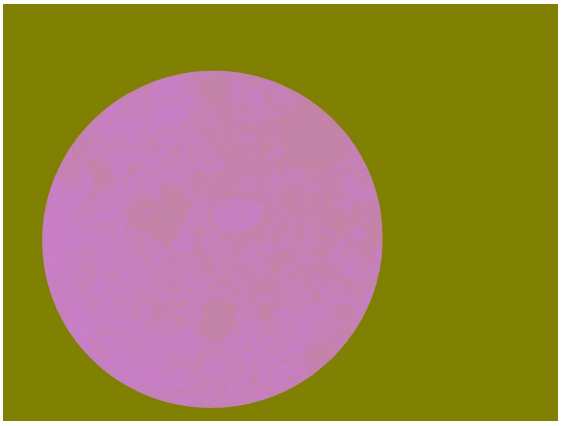
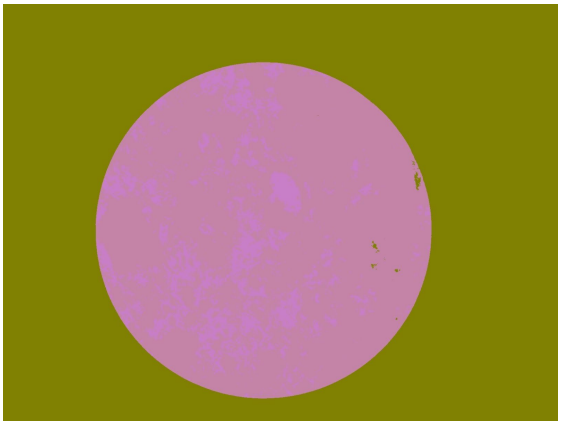
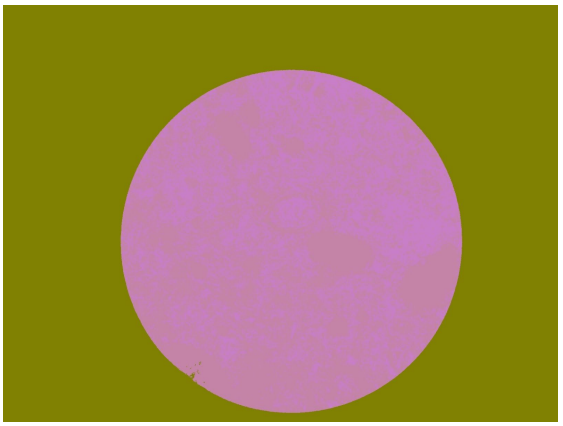


7

8



9



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The best colorspace to segment the *filaria* would be HSV, although the BGR colorspace produces a segmentation of the *filaria* that is much closer to the original image.

For the *plasmodium*, it is best to segment the images using HSV colorspace, which produces a much more visible contrast between the surrounding elements and the parasite.

Probably the hardest specimen to segment would be the *schistosoma*, since most of the pixels of the image are shades of yellow. While the easiest to segment would be *filaria*.