

## **Defining and dissecting adipose depots of rodents (a commentary by Susan K. Fried)**

The classic description of this process comes from a paper by Patricia R. Johnson and Jules Hirsch, *J Lipid Res.* 1972 Jan;13(1):2-11, Cellularity of adipose depots in six strains of genetically obese mice. I was taught by Dr Johnson and her colleague, Irving Faust, and I had the pleasure to also watch Dr. John Kral and Dr. Mario DiGirolamo do these dissections. My comments, greatly influenced by these colleagues, are given *in blue text*.

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### **INTRAABDOMINAL WHITE FAT PADS/DEPOTS:**

#### **Reproductive pads:**

##### Epididymal (males):

Johnson wrote: "The left epididymal pad was removed just distal to the major blood vessel in the base of the pad".



1.

As illustrated in Figure 1, it is quite easy to dissect the epididymal pad. After making a midline incision, the pad can be pulled up with a forceps. Note the large blood vessel described by Johnson.



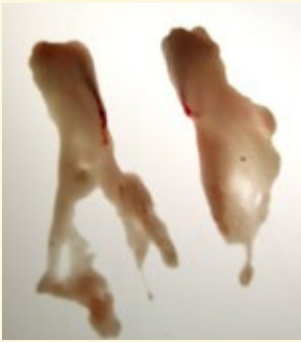
2.

Turn the pad over and you can see the epididymus. Many authors define the epididymal pad as starting at the blood vessel(2), because it is easy to see and the fat cells from there to the tip are on average smaller than those closer to the epididymus. The distal pad is less thick, making it easier to use for studies involving tissue slices (as many folks did in the old days). We would call that the 'distal epididymal fat pad' . It is completely reasonable to cut instead, just above the epididymus(3), and I would call that the whole epididymal fat pad.



3.

As long as one is clear about what is dissected (4).



4.

#### Parametrial (females):

"The left parametrial pad was cut at the midpoint of the base of the uterus and trimmed away along the length of the left horn and from around the left ovary."

*(images, description to be added)*

#### Retroperitoneal (RP) and perirenal:

Johnson wrote: "The left retroperitoneal pad was removed

as a triangular section extending from a vertex in the inguinal region up the midline and across at the lower pole of the kidney, extending laterally" as far as fat was visible"

In figure 5, you can see that the retroperitoneal fat pad of rodents can be found on the muscle at the back of the abdominal cavity, next to the kidneys. It should not be mixed up with the perirenal fat pad, that is seen 'around the kidney' . If the kidney is pulled toward the midline, the division between these pads can be seen (sometimes a problem with really fat animals)(fig 5).



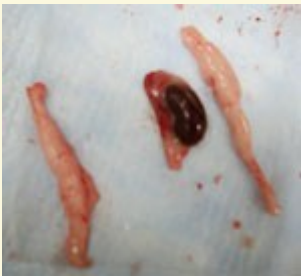
5.

In contrast to Johnson, when dissecting the RP, I continue past the kidney as far as the fat goes. This dissection leaves the perirenal (with embedded adrenal gland just above the kidney) in the animal. (fig 6)



6.

If desired, the perirenal fat could be dissected next. One should be careful to avoid the brown fat that is around the large vessel going to the kidney (unless you want BAT). Also note, Kral points out that the name 'retroperitoneal' for this pad is a misnomer, as it is within the peritoneal cavity of rodents. But as this is the common name in the literature, I think it is reasonable to use it. Some people combine perirenal and RP and call it perirenal and this confuses the literature quite a bit. So I would argue, whatever you do, describe it.



7.

### Mesenteric:

This visceral fat pad (i.e. it drains portally) is found along the intestine. It can be dissected by starting at the top of the duodenum, and 'stripping' the intestine of the fat by pulling gently or blunt

dissection till you get to the end of the colon (figs 8 and 9).

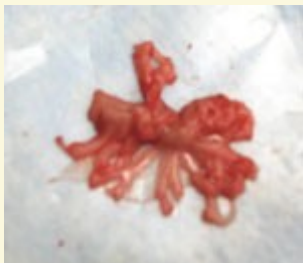


8.



9.

Note that there are many lymph nodes (Peyer's patches) embedded in the mesenteric fat and these should be dissected out (although I suspect this is nearly impossible to do completely). If I want RNA, I select a portion of fat closer to the duodenum (few lymph nodes) and look at it carefully and quickly (while keeping the pad cold – use an ice filled Petri dish).



10.

## Omental:

While this is a major pad in humans, found hanging down off the stomach, it is often non-existent in young mice or rats, and quite small in older animals. Be careful of the pancreas if you attempting to dissect. See figure 11.



11.

**A note on the term visceral.** Most of the literature on human obesity refers to visceral fat pads on ones that drain their blood into the portal vein (i.e. omental and mesenteric). The perirenal and retroperitoneal fat pads do not drain portally. In the rodent literature, the term visceral is often used to refer to other intraabdominal pads (e.g. epididymal, RP) . I think it is better to call these 'intraabdominal' rather than visceral.

## **SUBCUTANEOUS:**

## Dorsal subcutaneous:

Johnson wrote:

"The subcutaneous pad lying dorsal to the scapular region was removed in the following manner. With the animal lying first on the left and then on the right side, lateral cuts were made through the skin from the top of the haunch to the base of the ear to reveal the underlying fatty layer. At a point about midway of this cut, where the fatty sheath thins abruptly, lateral cuts were made into the fatty pad, following the line of the previous skin incision. Next, a cut was made through the skin just below the rib cage across the dorsal surface joining the two lateral incisions. The rectangular flap of skin produced by these procedures was then carefully peeled back rostrally, leaving the subcutaneous pad intact. The pad was carefully dissected away from the underlying muscle and fascia and floated intact in a petri dish containing warm saline. The intrascapular brown fat embedded in the white adipose pad was dissected away, as well as any strips of muscle adhering to the pad. This method results in the removal of a section of the subcutaneous fat of the



mouse which is anatomically reproducible."

Inguinal subcutaneous:

Johnson did not describe this in her paper, but she and Faust showed me. The skin all around the animal at the level of the bottom of the rib cage is cut and then 'peeled down', leaving all of the subcutaneous fat on the muscle layer. Placing the animal on its side, you can see that there appear to be two distinct pads (Figure 12).



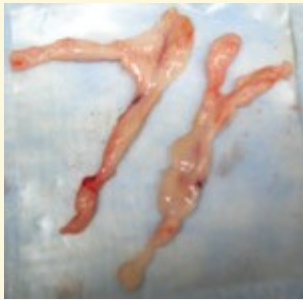
12.

Close to the back, you see what Cinti describes as dorsal lumbar. (fig 13) Turning the animal on its back, you see a nearly continuous subcutaneous pad extending into the groin and this is the inguinal.



13.

I think it is debatable whether the dorsal lumbar is included in the inguinal pad (I think most people include it – I do ). These are easily dissected off the muscle by starting with the animal on its side, and then moving it to its back as you remove the inguinal pad.



14.

Brown Adipose Tissue:



15.



16.



17.

