THE DETECTION OF BUTTER ADULTERATED WITH COCO-NUT FAT.

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THE ever increasing tendency to scientific adulteration teaches us the necessity of not judging the purity of butter by any single one of the accepted tests.

Until some time ago the Reichert process, or one of its modifications, was considered sufficient for all ordinary purposes; and still more recently the use of the oleorefractometer has been declared to be all that is necessary. Now, however, we have the advent of an inventor who is able to take away all taste and odour from coco-nut fat, and thus to render it available as an adulterant where there is a quick sale. To a certain extent it may be used to defeat the "Reichert," because, taking an average good butter, the distillate from which will absorb 14.0 c.c. of decinormal soda, and an average sample of coco-nut fat which will yield a distillate consuming 3.5 c.c., we notice that each 5 per cent. of the latter fat added to butter will only reduce the soda used by about .50 c.c., and it is thus possible to adulterate to the extent of 20 per cent., and yet the butter will pass the 12 c.c. limit; while, if we are to take account of the famous Danish butter and those exceptional samples brought to our notice by Dr. Vieth, we could have a 40 per cent. adulteration passing with impunity by the Reichert process. This is bad, but the refractometer is in a similar position, because if we take one-half coco fat and one-half margarine, we can make an article that shows a refraction of -33 , and thus comes out pure butter. I had, in common with our President, been struck with the fact that there was so much cheap butter about that just showed exactly 12 c.c. with Reichert, and I set myself to solve the mystery, because the use of the small quantity of ordinary margarine necessary to make this reduction would scarcely repay the labour of the manufacture. After some

research I came across several samples absorbing 12 c.c. of soda, and which when examined in the refractometer came out far too good, and I then saw that the key to the whole affair was that the use of coco-fat by the adulterator must be met by the joint employment of both the refractometer and the Reichert on every sample. Given the use by the analyst of both these tests, then the mixing of butter with 25 per cent. of coco-fat, and its passing us as standard butter, will be a thing of the past. In illustration of this I give a few figures of some mixtures that were made with care, and the analysis divided between two persons who did not know what the samples were. The "Reichert" process was done by Mr. Burford, of Leicester, one of my pupils, who is now working on to get his Institute diploma, while the refractions were done by myself.

	Nature of Sample.	Reichert.	Refraction.
Experiment	1. All coco-nut fat	3.5 c.c.	—54
"	2. Pure butter of good quality ..	14.5 c.c.	—34
"	3. Butter with 75 per cent. coco	6.0	—49
"	4. " 50 " "	9.0	—44
"	5. " 25 " "	12.0	—39

The refraction of the coco-nut fat is so great as to be beyond the scale of the ordinary instrument, and has therefore to be got by using a half-and-half mixture with "typical oil," which shows — 27.

	Nature of Sample.	Reichert.	Refraction.
Experiment	6. Margarine	1.3 c.c.	—8.5
"	7. Butter with 75 per cent. margarine	4.5 c.c.	—15.0
"	8. " 50 " "	7.8 c.c.	—22.0
"	9. " 25 " "	10.9 c.c.	—27.0
"	10. Margarine with 50 per cent. coco ..	2.8 c.c.	—32.0
"	11. Butter with 25 per cent. margarine and 25 per cent. coco-nut fat }	8.8 c.c.	—33
"	12. Butter with 50 per cent. margarine and 25 per cent. coco-nut fat }	5.6 c.c.	—27

The margarine used was that now commonly sold in London, and contained some vegetable oil, probably cotton, thus lessening its refraction, that of pure beef oleo-margarine being generally — 13°.

It is thus evident that while each 5 per cent. of coco-nut fat added to butter *increases* its left-handed refraction by one degree, while it *reduces* the soda consumed in the Reichert process by 50 per cent. If, therefore, I had a butter showing a refraction of 37 and a Reichert of 12, I should have no hesitation in charging it with 20 per cent. of coco-fat.

Mixtures Nos. 5 and 9 would pass by a Reichert limit taken on the lowest recorded natural butter, but they are caught by the refraction; while Nos. 10 and 11, which would defeat the refractometer, are at once detected by Reichert.

There is a decided relation between the refraction and the Reichert indication of all pure butters. The highest refraction I ever met with was in a butter showing — 36. I naturally suspected coco-fat, but on applying Reichert I got the large result of 16 c.c. I am now engaged in verifying this relationship, and I put forward the following figures tentatively as a basis for others to take up the matter.

Refraction.	Reichert.
—36	16
—35	15·25
—34	14·50
—33	13·75
—32	13·00
—31	12·25
—30	11·50
—29	10·75

When we have to deal with butter reduced by margarine this steady relation fails, and we have (as in experiment 9) a drop in the refraction. This matter I put forward tentatively only at the moment, in the hope that it will work out to a useful indication.