

## Biological value of the proteins of a variety of fish meals

BY A. E. BENDER AND SHEILA HAIZELDEN

*Bovril Ltd, 148 Old Street, London, E.C. 1*

*(Received 21 August 1956)*

The nutritive values of a series of commercial fish meals and deodorized fish flours intended for human consumption have recently been examined for the Food and Agriculture Organization of the United Nations. It is well known that fish protein can be damaged during drying, although this damage does not necessarily occur, and as these meals were prepared under widely varying conditions in six different countries, it was considered that the results might be worthy of note.

### EXPERIMENTAL

The net protein utilization (N.P.U.) was determined on rats by the method of Bender & Miller (1953) and Miller & Bender (1955). Digestibility of the protein was determined in the same experiments and the biological value was calculated by dividing N.P.U. by digestibility.

### RESULTS

The results are shown in Table 1. The values are the means of the results of several replicate estimations made on different groups of rats. A brief description of each material is included in the table but details of the drying process have not been revealed. It was considered unwise to reveal the country of origin, which is, therefore, merely indicated by a number so that products from the same country can be grouped together.

### DISCUSSION

The N.P.U. of laboratory preparations of codfish meal, apparently undamaged, was found to be 84 (Bender, Miller & Tunnah, 1953) when determined by the same method as used in the present work. The results on the series examined here show N.P.U.'s of fish meals ranging from 80 for undamaged material to values as low as 18 for grossly maltreated fish meal.

Several of the meals were tested before and after defatting and deodorization. There was no consistent evidence of serious damage resulting from this treatment.

### SUMMARY

1. Twenty-seven fish meals and deodorized fish flours intended for human consumption were examined for net protein utilization (N.P.U.) and digestibility by the carcass-analysis method.
2. N.P.U.'s ranged from 18 to 80.
3. There was no consistent evidence of serious damage resulting from the defatting and deodorization whereby fish meals are converted to edible fish flours.

Table 1. *Analysis and net protein utilization, digestibility and biological value of various fish meals*

Sample	Country of origin	Type of meal or flour	Protein (%)	Minerals (%)	Fat (%)	Net protein utilization	Digestibility (%)	Biological value
A	I	Sardine; commercial	63.8	14.9	7.4	67	87	77
AC	I	Sardine; defatted and deodorized	81.8	9.6	0.5	70	—	—
B	II	Lean fish; commercial	59.0	26.5	9.1	69	88	78
P	II	Lean fish; commercial	68.7	17.6	5.5	72	96	75
Q	II	Lean fish; commercial	72.5	15.6	9.5	70	97	73
Z	II	Lean fish; commercial	68.5	17.0	5.9	80	—	—
C	III	Cod; commercial	68.6	16.6	3.1	62	94	66
D	III	Lean fish; commercial	63.2	26.4	6.5	57	93	61
E	III	D defatted and deodorized	70.2	24.8	0.3	49	93	53
F	III	Cod; extracted	77.5	13.5	0.3	71	92	77
G	III	F deodorized	76.9	13.1	0.3	70	92	76
H	III	Cod; defatted and deodorized	74.0	22.6	0.1	65	95	69
I	III	Cod fillets; defatted and deodorized	89.1	4.4	0.2	64	95	67
J	III	Herring; defatted and deodorized	87.0	3.1	0.3	74	93	79
V	II	Lean fish; Z defatted and deodorized	75.2	13.5	0.3	73	93	78
W	III	Lean fish; commercial	61.3	23.0	3.6	71	95	76
X	III	W defatted and deodorized	64.7	24.8	1.2	77	94	82
Y	III	Lean fish; defatted and deodorized	71.3	24.8	1.2	77	96	80
K	IV	Fatty fish; defatted and deodorized	72.7	21.2	0.1	29	81	36
L	IV	Fatty fish; defatted and deodorized	73.4	20.5	0.1	31	68	46
M	IV	Fatty fish; defatted and deodorized	66.6	20.0	0.1	42	71	59
N	V	Semi-lean fish; defatted and deodorized	74.8	17.5	0.3	18	47	39
O	V	Semi-lean fish; defatted and deodorized	79.4	19.4	0.1	67	94	71
R	V	Semi-lean fish; defatted and deodorized	74.7	19.4	0.2	55	96	58
S	VI	Herring; commercial	70.0	9.9	6.7	64	94	68
T	VI	S defatted	84.2	10.2	0.5	57	96	59
U	VI	S defatted and deodorized	83.0	10.4	0.6	56	94	60

## REFERENCES

- Bender, A. E. & Miller, D. S. (1953). *Biochem. J.* **53**, vii.  
 Bender, A. E., Miller, D. S. & Tunnah, E. J. (1953). *Proc. Nutr. Soc.* **12**, ii.  
 Miller, D. S. & Bender, A. E. (1955). *Brit. J. Nutr.* **9**, 382.