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Impact of voluntary fortification and supplement use on dietary intakes of folate and status in an Irish adult population

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Mandatory folic acid fortification in the US has significantly increased folic acid intakes and folate status in all subgroups of their population[(1)]. Now concerns are growing regarding the possible adverse effects of these high intakes and status levels[(2–3)]. Ireland and the UK are examples of countries where a voluntary folic acid fortification policy exists but little is known about how this practice in addition to supplement use effects total folate intakes and status.

The aim of this study is to examine the impact of voluntary fortification and supplement use on total folate intakes and folate status in an Irish adult population. Participants who provided a 4-day food diary and a blood sample as part of the National Adult Nutrition Survey were included ($n = 1126$) in the analysis[(4)]. Natural folate and folic acid from fortified foods and supplements were determined for each food consumed. Participants were categorised into four consumption groups based on their source of folic acid intake. Red cell folate (RCF) and serum folate (SF) were measured by microbiological assay.

	Non-Consumers[1]	Fortified food (FF) consumers[2]	Supplement user[3]	FF & supplement consumer[4]	*P*
n	*201*	*767*	*35*	*123*	
Male:female (%)	48:52	52:48	43:57	43:57	0.169
Age	45 (31, 55.5)*	42 (28, 55)	38 (26, 58)	38 (27, 52)	0.273
Dietary intake (μg)					
Natural folate	206 (160, 295)	223 (176, 284)	239 (177, 310)	246 (185, 309)	0.983
Total folic acid	–	69 (32, 142)^{a}	200 (150, 400)^{b}	287 (220, 438)^{b}	<0.001
Total folate	206 (160, 295)^{a}	311 (239, 427)^{b}	557 (365, 629)^{c}	582 (431, 746)^{c}	<0.001
B vitamin status					
Serum folate (nmol/l)	17.0 (12.3, 24.3)^{a}	26.1 (17.4, 37.8)^{b}	30.2 (22.3, 46.4)^{bc}	44.9 (29.2, 68.6)^{c}	<0.001
High SF (>45.3 nmol/) %	5.0^{a}	18.5^{b}	25.7^{b}	48.0^{c}	<0.001
RCF (nmol/l)	702 (538, 936)^{a}	885 (697, 1194)^{b}	1000 (804, 1444)^{bc}	1159 (828, 1519)^{c}	<0.001
Low RCF (<453 nmol/l) %	10.4^{a}	5.6^{b}	0^{b}	1.6^{b}	0.003

[1]Non consumers of folic acid; [2]Consumers of folic acid from fortified foods only; [3]Consumers of folic acid from supplements only. [4]Consumers of folic acid from fortified foods and supplements; *Median and interquartile range in parentheses (all such values). Differences between groups were determined by ANCOVA with bonferroni post hoc tests on log transformed variables where applicable; controlling for smoking and energy intake. Different subscripted letters indicate significant differences between groups. $P<0.05$ was considered significant.

Total folate intakes, serum folate and RCF were significantly higher in folic acid consumers compared to non consumers. Supplement users had significantly higher folic acid intakes and folate status than those who consumed folic acid from fortified foods alone. Non consumers of folic acid had a significantly higher prevalence of low RCF and a lower prevalence of high serum folate than consumers. These results show an uneven distribution of folic acid intakes across population subgroups due to voluntary fortification and supplement use. Although the majority of the population may have a higher folate status associated with voluntary fortification and supplement use, non consumers of folic acid (18%) may be at risk of suboptimal status. Furthermore, of potential concern is the high prevalence of high serum folate levels, which may have adverse consequences in terms of unmetabolised folic acid[(2)].

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