were drawn for an assessment of cholesterol (C), TG, apoproteins A and B, LpB:CIII and LpE:B levels. Statistical differences were tested by the Student's *t*-test. For each lipidic parameter, a stepwise linear regression was conducted to evaluate the independant contribution of shift work, age, body mass index (BMI), smoking, energy and alcohol intake. Both groups did not differ for BMI, energy intake and smoking. Whereas, day workers had a higher alcohol intake (15.6 vs 9.3 g, $P = 0.03$), TG (1.25 ± 0.61 vs 0.99 ± 0.56, $P = 0.004$) and LpB:CIII (0.22 ± 0.15 vs 0.17 ± 0.1, $P = 0.03$) were higher among shift workers. In the stepwise linear regression, shiftwork ($\beta = 0.27$, $P = 0.008$), BMI ($\beta = 0.26$, $P = 0.009$) and smoking ($\beta = 0.2$, $P = 0.005$) contributed independantly to TG level. LpB:CIII was only associated with shift work ($\beta = 0.18$, $P = 0.01$) and LpE:B with smoking ($\beta = 0.25$, $P = 0.003$). We did not find any relationship between alcohol and TG, perhaps because of the relatively low alcohol intake among this population. This study suggests that shift work and smoking-induced hypertriglyceridemia may have different mechanisms: higher production by stress-induced lipolysis in case of shift work, whereas increased levels of LpE:B suggest an impaired removal among smokers.

FOODS–NUTRIENTS

Resistant starch may have a more potent cholesterol-lowering effect than cholestyramine, in spite of having less effect on the fecal excretion of neutral or acidic steroids. H Younes, MA Levrat, C Demigné, C Rémésy *(Laboratoire des maladies métaboliques, Inra-Clermont-Ferrand/Theix, 63122 Saint-Genès-Champanelle, France)*

Cholesterol elimination from the body pool takes place chiefly in the digestive tract, especially as bile acids and various plant products (fibers, resistant starch, phytosterols, polyphenols) or resins (cholestyramine) are able to enhance the fecal excretion of steroids. Abadie et al (1994) have shown that resistant starches also have a capacity for bile acid adsorption, in particular chenodeoxycholic and deoxycholic acid. The question arises as to whether these resistant starches have cholesterol-lowering effects comparable to those of certain soluble fibers or steroid-sequesterants.

In the present experiment (diets containing 5% groundnut oil), the resistant starch was crude potato starch (25% in the diet), replacing wheat starch (basal: 73%). Three experimental groups were used: controls, cholestyramine 0.8% or resistant starch 25%. The underlying aim of this work was to assess the respective effects of the fermentations and of the stimulation of bile acid excretion on plasma lipids.

Resistant starch is readily fermented by microbial microflora and it induces a considerable increase in the production and absorption of short-chain fatty acids (SCFA). Although cholestyramine was more effective at increasing steroid excretion, only resistant starch significantly lowered plasma lipid levels (plasma cholesterol or triglycerides: –30%). In response to accelerated steroid losses, there was an induction of HMG-CoA reductase activity, which was higher with cholestyramine than with resistant starch. FAS activity was depressed in rats fed resistant starch. In these animals, there was a decrease in the amount of cholesterol in all the lipoprotein fractions, especially HDL1 (d 1 040–1 080), whereas there was no significant cholesterol change in this fraction for the rats fed cholestyramine. Differences between resistant starch and cholestyramine were more striking for the TGLRP fraction which only decreased in rats fed resistant starch.

The differences observed between resistant starch and cholestyramine could be

ascribed to intestinal fermentations and their consequences on liver lipid metabolism. When large intestine fermentation levels are low, elevating the rate of fecal steroid excretion seems to have limited effects on plasma lipid concentrations. In various pathophysiological situations, the intake of plant foods (rich in fibers or resistant starch) appears promising as it promotes cholesterol elimination from the body pool.

Comparison of metabolic responses to digestible and partly undigestible starches in healthy humans. L Achour, B Flourié, F Briet, C Franchisseur, F Bornet, JC Rambaud, B Messing *(Inserm U 290, hôpital Saint-Lazare, 75010 and Éridania Béghin-Say, 75008 Paris, France)*

Starch is the main energetic fuel in the human diet. Most starches are extensively digested in the human small intestine. It is now technologically possible to modify starch in order to slow down its digestion in the small intestine. The digestion of technologically modified starches will start in the small intestine and continue in the colon, where its fermentation releases short chain fatty acids (mainly acetate) and gases (H_2, CO_2). The metabolic consequences of this shift in starch digestion is unknown in healthy humans.

In this study, we measured certain metabolic indexes in healthy humans consuming a highly digestible corn starch (Dig S) in the small intestine and the same corn starch after retrogradation (Ret S).

Eight healthy volunteers were studied during two periods separated by 1 week. In each period, fasting volunteers consumed at 8:00 am a 425 kcal test meal in addition to 50 g of either the Dig S or Ret S. Blood and breath were sampled in the absorptive period hourly for 8 h. The same meal was given again the same day at 10:00 pm. At 8:00 am on the next morning, ie, 10 h after the ingestion of the test meal, blood and breath were sampled in the fasting subjects hourly for 3 h ie, in the postabsorptive period.

In the absorptive period, after the ingestion of Dig S, the glycemic index and area under the insulin curve were higher, and blood glycerol concentrations were lower ($P < 0.05$) than after the ingestion of Ret S. In the postabsorptive period, after the ingestion of Dig S the respiratory quotient, $^{13}CO_2$ and H_2 excretion in breath, blood acetate concentrations and satiety index were significantly lower, whereas blood glycerol concentrations were higher ($P < 0.05$) than after the ingestion of Ret S.

In healthy humans, the digestion of Ret S is slow in the small intestine and its colonic fermentation continues 10 to 13 h after its ingestion. Compared to the highly Dig S, the shift in starch digestion induced by retrogradation leads to changes in metabolic responses: Ret S reduces the glycemic and insulinic responses in the absorptive period, and lipolysis in the postabsorptive period. This last effect may be related to an inhibitory action on the lipolysis of short chain fatty acids produced during the colonic fermentation of unabsorbed starch.

Chronic ingestion of a high fat cholesterol diet increased postprandial lipemia and atheroma deposition in New Zealand white (NZW) rabbits. C Juhel, C Dubois, M Senft, D Lairon *(Unité 130-Inserm, National Institute of Health and Medical Research, 18, avenue Mozart, 13009 Marseille, France)*

Several recent human studies have shown the existence of some links between altered patterns of postprandial lipemia and the risk of atherosclerosis. Nevertheless, the mechanisms involved are still unknown. We therefore performed the present study in the NZW rabbit, given its capacity to